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Chicago, March 2, 1929 (Issued Every Other Week) Volume XXXII, No. 5

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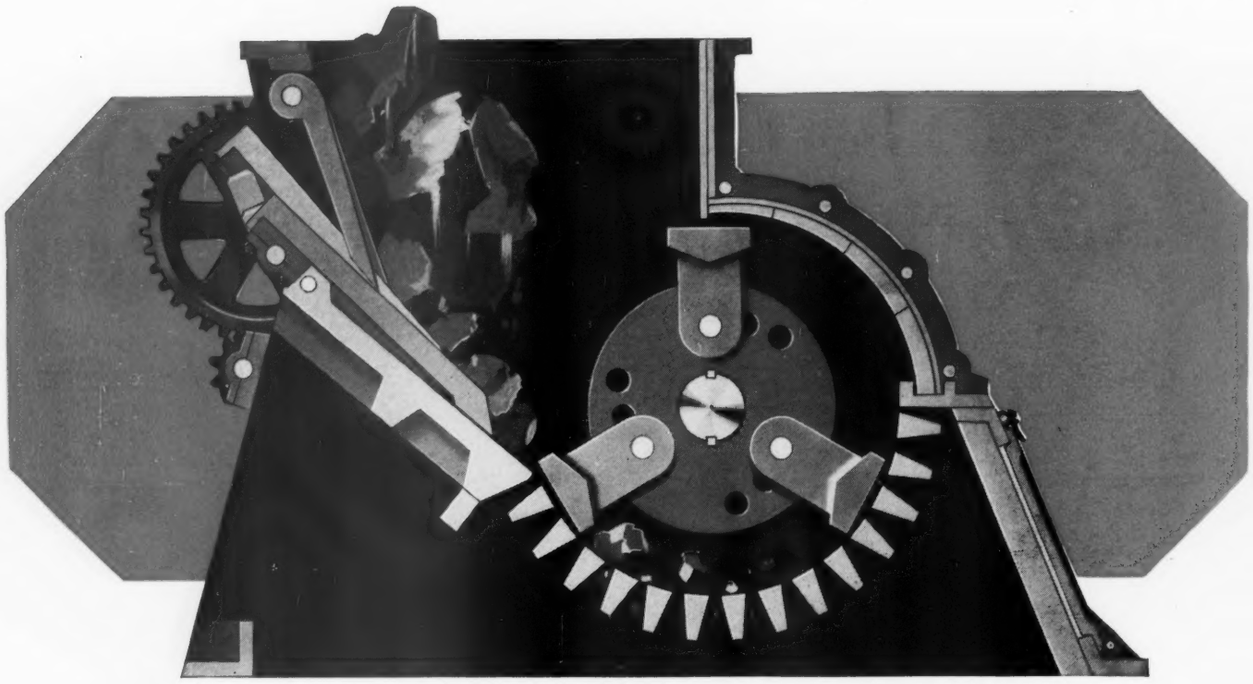

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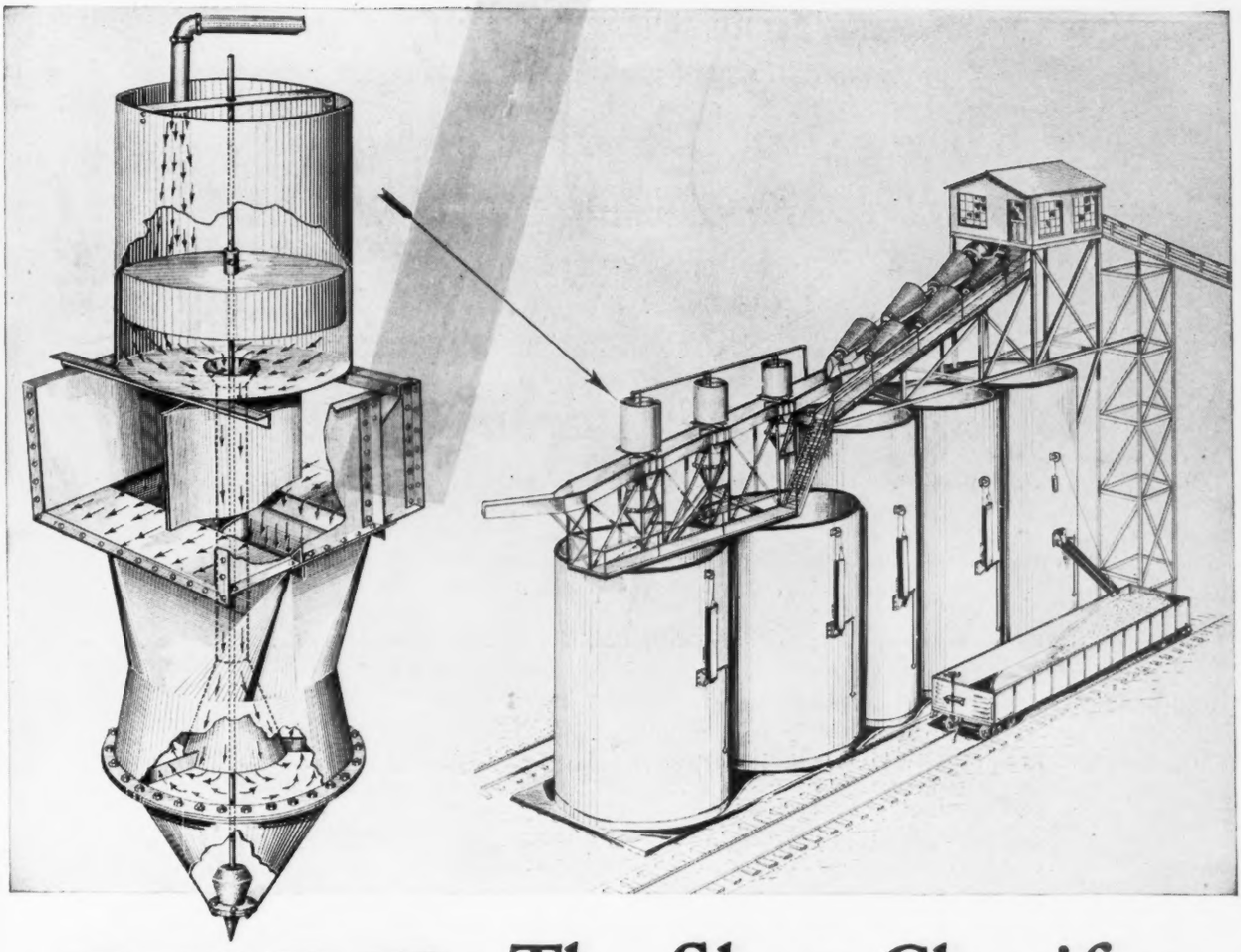

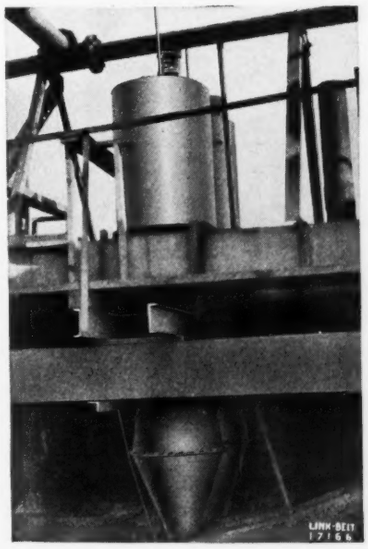

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Contents for March 2, 1929

New Velo Cement Plant of the Missouri Portland Cement Co. **33-35**
First plant in America specifically designed to make quick-hardening portland cement.

Proceedings of the American Concrete Institute Convention **56-64**
Recent Detroit meeting a real educational institute on many phases of concrete manufacture. Pickings of interest to cement and aggregate producers.

Reminiscences of a Trip to the British Institute of Quarrying Convention **65**
By W. E. Farrell.

Central West Lime Manufacturers Organize Statistical Bureau **73, 74**
Report production and sales statistics monthly.

Recent Developments in the Rock Products Industry in Los Angeles Territory .. **75-77**
Consolidated Rock Products Co. organized: Furor over proposed new cement mill. By Edmund Shaw.

Accident Prevention Progress in the Cement Industry **85-88**
Regional meetings at Kansas City and Dallas.

Non-Metallic Mineral Meeting of the American Institute of Mining Engineers **90**
Papers on soapstone, clay, potash and bentonite.

Portland Cement Statistics for January **82, 83**

Departments

Hints and Helps for Superintendents **66, 67**
Editorial Comment **69**
Foreign Abstracts and Patent Review **78, 79**
Traffic and Transportation **80, 81**
Cement Products **91-94**
Current Prices of Rock Products **95-99**
New Machinery and Equipment **100**
News of the Rock Products Industry **77, 84**
News of All the Industries **102, 104**
Classified Index of Advertisers **112, 118**

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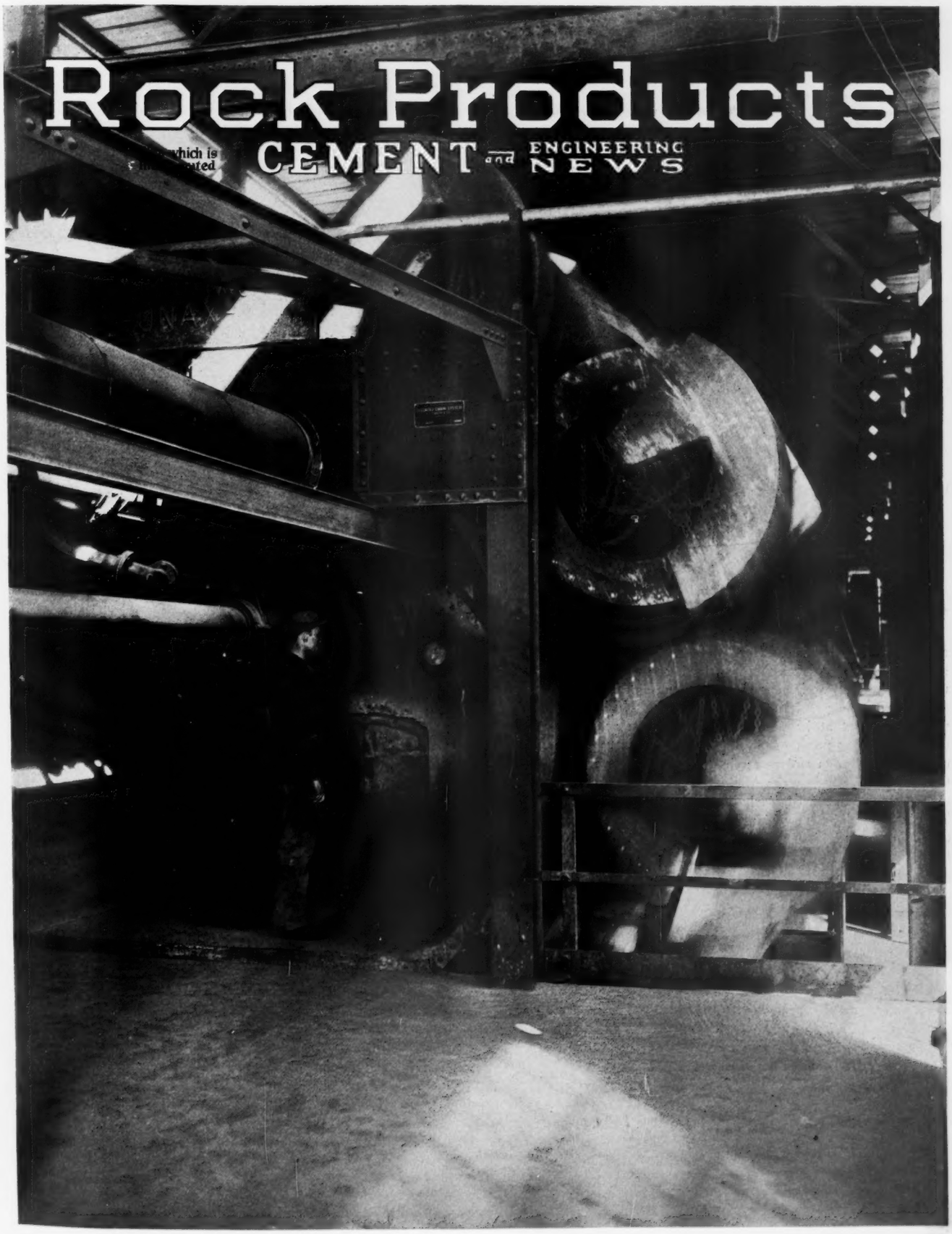
Volume XXXII Chicago, March 2, 1929 No. 5

Rock Products

CEMENT and ENGINEERING NEWS



Firing end (with coolers) of the kiln at the new "Prestolith" Velo portland cement plant of the Missouri Portland Cement Co.

General view of the new Velo portland cement plant of the Missouri Portland Cement Co., Prospect Hill, Mo.

New "Velo" Plant of Missouri Portland Cement Company

The First Plant in America Designed Specifically to Make "Velo" Rapid-Hardening Portland Cement

THE MISSOURI PORTLAND CEMENT CO., St. Louis, Mo., has for some time been producing high early strength, or quick-hardening portland cement, using the equipment ordinarily employed for the production of standard portland cement at its Prospect Hill, Mo., plant, nine miles north of St. Louis. After extensive trial tests and research work primarily to prove the merits of this product, the company announced, early in 1927, its intention to build a new plant to manufacture this type of high early strength portland cement exclusively, and accordingly during the latter part of May, 1927, started construction of the plant alongside of and to the east of the older plant.

The new plant was designed by the F. L. Smidth and Co., New York, and is so arranged that the equipment also can be used for the production of standard portland if desired. The rated capacity is 1800 bbl. of "Velo," or 2000 bbl. of standard portland per day, and the actual operating capacity has attained those figures easily. This additional tonnage increases the total capacity of the Prospect Hill plant of the Missouri Portland Cement Co. from 7000 to 9000 bbl. of standard portland cement per day, or 8800 bbl. of standard portland and Velo cements combined.

During the past few years several high early strength portland cements have been placed on the market under various trade names. That selected in this case is "Prestolith" Velo by the Missouri Portland Cement Co. Most of these new cements can all be classed as true portlands, and can be used wherever ordinary portland cement would be suitable, and they differ from standard portlands only in that the operations are conducted with greater care and refinements, and they have a much higher degree of fineness.

The exact analysis of the raw materials going to make up the cement, their proportions, and some of the finer points of operating are the company's secret, but a comparison of the average analysis of standard cement with those of several different brands of high early strength cements by Eckles* shows the following:

(Cement Limes and Plasters, Eckles. Third Edition.)

Number Cements Analyzed	Year	Location	SiO_2	Al_2O_3	F_2O_3	CaO	MgO	SO_3	Cementation Index
80	1905	American	21.83	7.43	3.31	62.51	1.85	1.33	1.14
118	1919	German	21.47	7.18	2.75	63.57	1.62	2.00	1.09
13	1927	French and Belgium	22.22	6.24	2.60	63.85	1.22	1.07	1.11
5	1927	European High Early Strength Cements	20.54	5.57	3.52	63.37	1.48	1.52	1.05
5	.....	Europe and America	8.85	42.87	6.89	40.57	0.46	.....	.....

This cement should not be confused with the high alumina cements, the analysis of which for convenience and comparison is also included in the above table.

The cement known as "Velo" was developed in Denmark several years ago by Carl Pontoppidan, chief research chemical engineer of F. L. Smidth and Co., and the process patents are licensed in America through F. L. Smidth and Co. This cement has the property of developing high compressive and tensile strengths within a very short time, and by way of illustration the following table will give an idea as to the strengths developed compared to ordinary cement:

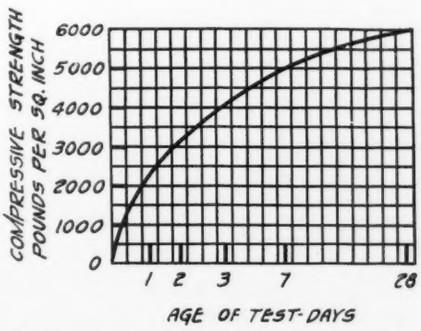
TENSILE STRENGTH

	1 day	3 days	7 days	28 days
Ordinary cement			225	325
Velo	340	413	432	

COMPRESSIVE STRENGTH

	1 day	3 days	7 days	28 days
Ordinary cement	510	1146		2588
Velo	1750	3304	5614	

It is claimed that at the end of one year both the tensile strength and compression strength of Velo cement will show a higher figure than that given for ordinary cement under similar conditions. The Missouri Portland Cement Co. has adopted as its copyrighted name for this cement "Prestolith" Velo, or translated, "quick stone," and is pioneering the use of this cement by a systematic advertising campaign using the



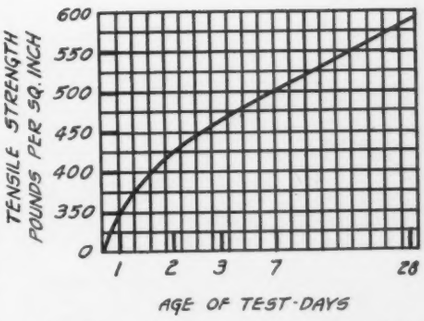
Compressive strength of Prestolith Velo cement (6x12-in. cylinders; 1:2:4 mix, using 6 gal. of water per sack of cement). Average of results secured by several testing laboratories

leading American magazines to impress the users of cement with the fact that this cement can be "placed today and used tomorrow."

Construction Difficulties

At the site chosen it was necessary to do considerable excavating and grading and to take unusual precautions to secure a good foundation and footings for the various silos, kiln stack and other heavy mill structures. The soil at this place is a medium soft clay and extends to unusual depths, for this vicinity, as ordinarily the top soils adjacent to St. Louis are seldom over a few feet thick. Here, however, even at depth of 60 ft. no limestone or rock ledges were encountered, although several thin seams were passed through before attaining this depth.

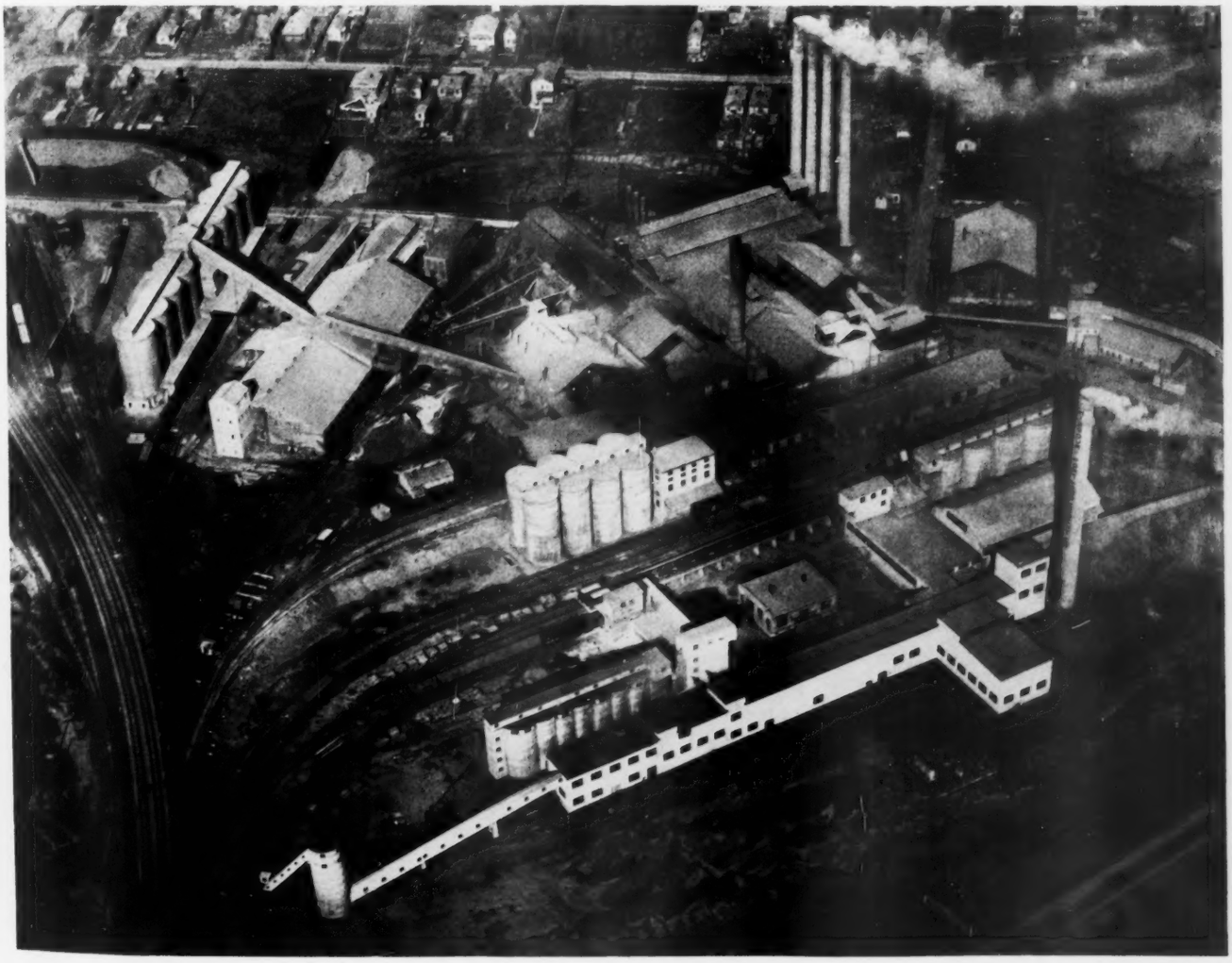
In constructing the 223-ft. stack it was deemed necessary to sink a cylindrical caisson of slightly larger diameter than the base of the stack, 62 ft. to hardpan, which was accomplished by first casting a section of the cylinder of reinforced concrete with the lower or bottom edge sharpened to form a cutting edge. This cylinder was allowed to settle from its own weight by excavating from the interior, and as it became necessary, other sections were cast on top of the first. In the event that one side settled faster than the other, three or four holes were drilled alongside the caisson on the high side and one-half a stick of dynamite exploded in each hole, which loosened the ground enough for proper settlement. When



Tensile strength of Prestolith Velo cement 1:3 standard mortar briquets —average results secured by several testing laboratories

the cutting edge had reached hardpan the bottom of the pit was widened out to form a large base area, and this portion was then filled with Velo cement.

The original plans called for filling the total volume of the caisson with a 1:6:12 mix of concrete, but this was not done as it was later considered unnecessary; but a 2-ft. thick top slab of reinforced concrete (1:2:4) was cast over the top of this cylin-



Aeroplane view of both old and new mills of the Missouri Portland Cement Co. at Prospect Hill, Mo.; new Velo plant in the foreground

Crushing plant at Ft. Bellefontaine, Mo.

Quarry railway tracks on river banks

der to form the base of the stack proper. The stack has a diameter at the base of 19 ft. 5 in., weighs 1,037 tons and the footings and top slab weigh an additional 818 tons, or a total of 1,855 tons. This gives a dead weight of roughly 6 tons per sq. ft. of stack base area.

Similary caissons were sunk to depths of from 40 to 60 ft. for footings for the stone, clinker and cement silos, although they were cast a reinforced slab which forms the base of the storage bin in each instance.

In addition to the large amount of caisson work necessary for supporting the silos and stack 35,000 lin. ft. of concrete piling was placed in lengths of 30 to 60 ft. under the slurry basins, kiln piers and grinding units. The silos above the concrete foundation slabs were built by the Gamble Construction Co. of St. Louis, but the foundations as well as

tos Shingle Slate and Sheathing Co. and Eternite, Inc., both plants which adjoin that of the cement company).

Quarry Operation

Velo cement at Prospect Hill is made from three materials: limestone, shale and clay. The limestone is secured from the quarry at Fort Bellefontaine, Mo., about 18 miles north of St. Louis, and nine miles

Limestone quarry at Bellefontaine

Employes' homes at Bellefontaine

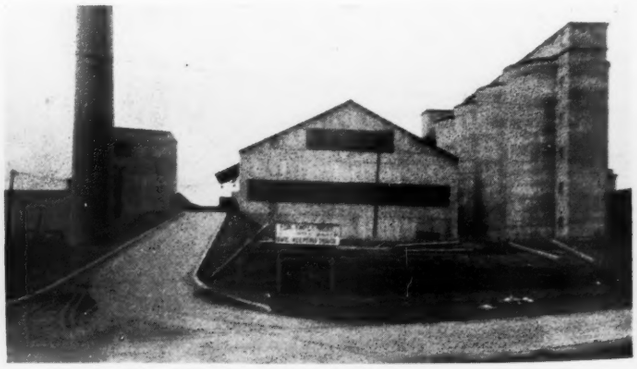
of smaller diameter than the one for the stacks foundation.

There were four caissons 8 ft. outside diameter and 6 ft. 4 in. inside diameter under each silo, making 32 under the cement bins, 16 under the stone and 16 for the clinker silos. On top of these caissons were cast reinforced-concrete girders, which act as the walls of the reclaiming tunnels under the silos and on top of these girders was

the balance of the plant, excepting the stack, were built by the Fruin and Colnon Contracting Co., St. Louis, Mo. The stack was built by the John V. Boland Construction Co., St. Louis. All the plant buildings are of steel and reinforced-concrete construction, and the buildings are covered with corrugated asbestos sheathing (which incidentally was made from Missouri Portland Cement Co.'s cement in the plants of both the Asbes-

north of the plant on the west bank of the Missouri river, just across the river from West Alton, Mo. The Chicago, Burlington and Quincy R. R. and the highway connecting Fort Bellefontaine and West Alton passes between the company's crushing plant and the quarry site. The rock trains from the quarry pass under the west approaches of both the railroad bridge and the Lewis and Clark highway toll bridge that connects

Partial view of shale pit



Ramp at plant for clay trucks

Clay-pit operation

those two towns with a modern highway.

The earlier operations were conducted within a few hundred feet of the river's edge, but at present the quarry face has been extended back from the river approximately 1000 ft., and the face extends laterally to form a rough semi-circle about 3000 ft. long. The quarry face will average 65 ft. high and is operated as a single bench. There is, in places, considerable overburden consisting of a sandy loam, which is removed by two steam shovels, one Marion 80 with a 2¼-yd. bucket mounted on standard railroad equipment and the other a ¾-yd., full revolving Osgood, mounted on crawler treads.

The bench is drilled by three Cyclone and one Armstrong well drills, with holes spaced from 15 to 20 ft. centers and burdens depending on the character of the ground, some of the areas being cut by many deep vertical seams. The holes are loaded with a 40% gelatine dynamite and exploded with Cordeau Bickford. Some secondary shooting is done, and drilling for this work is done by Ingersoll-Rand drills and compressors.

The rock is loaded into 5-yd., wooden body, end-dump cars made after designs of the company, by two, steam Marion, Model 100 shovels, both with crawler treads, one having a 2¾-yd. bucket and the second a 2½-yd. Trains of 10 cars each are hauled to the foot of the incline serving the crushing plant by steam dinkies, nine in all, consisting of Porter, Vulcan and Davenport types. There are between 100 and 125 rock cars for rock haulage in this operation.

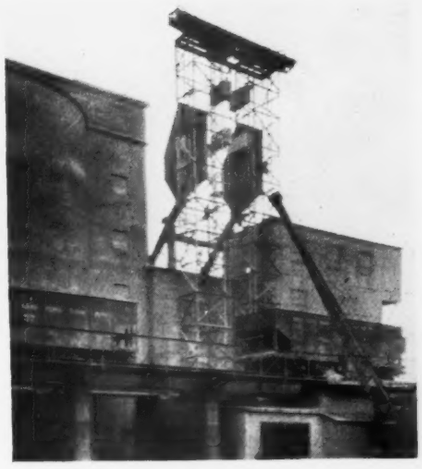
Rock-Crushing Plant

The cars are hoisted up a short incline, and on arriving at the 42-in. McCulley gyratory crusher, are pulled up another short steep incline and at the same time unlatched allowing the rock to slide to the crusher. The crusher is set to deliver a 5-in. product, and is driven by a 100-hp. electric motor. The crusher discharges to a 52-in. steel inclined pan conveyor that discharges to a 40-in. shuttle belt conveyor that distributes the material to reinforced-concrete storage bins holding a total of 5000 tons. The pan elevator and the shuttle conveyor are driven by 30-hp. and 10-hp. motors respectively.

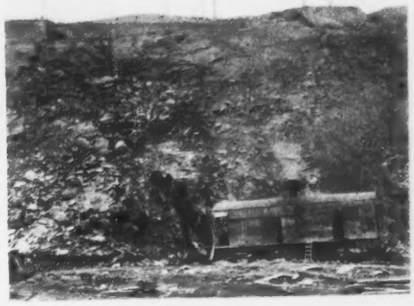
The company has provided neat appearing cottages for employes and dormitories and a boarding house for the single men. The quarry and crushing plant employs 112 men, which includes labor necessary for maintaining the boarding house and other camp incidentals.

The company owns 51, standard-gage, steel, hopper-bottom gondola cars, which are loaded from the crushing-plant storage bins by horizontal rack and pinion gates located under the bottoms of the bins. The rock falls direct to cars, which can be spotted on either of two parallel tracks under the storage bins. The Burlington railroad hauls the limestone to the cement plant at Prospect Hill.

Raw-material storage and handling equipment



Balanced skip-hoists for handling raw materials



Loading shale for Velo plant

Shale loading plant for Velo cement manufacture

Shale Quarry Operations

The shale for Velo production is taken from the pit a short distance north of the

plant, and is loaded into 1¼-yd. Koppel cars by a model 80 Marion shovel mounted on crawler treads equipped with a 1¼-yd. bucket. There is also available for this work a No. 37 Marion electric on full crawler treads equipped with a 2-yd. dipper. The electric shovel also is used for stripping the overburden from the shale pits. The shale after loading is hauled to the foot of the incline by a 2-ton Caterpillar tractor that pulls the loads in trains of 6 to 16 cars, depending on weather conditions, dry weather permitting better traction and consequently longer trains. The tractor is also equipped with a bumper, and when necessary or convenient, pushes the cars up the grade from the pit to the foot of the incline to the shale-crushing plant that serves the older portland cement plant.

The shale bank is worked from one high bank, roughly 85 ft. in height, and owing to its hardness or toughness it must be shot down. For this purpose well-drill holes are loaded with comparatively small charges of 20% gelatin dynamite and exploded. No secondary shooting is necessary.

The cars of shale are hoisted one at a time up the incline by an endless chain equipped with lugs that engage with the lower frame of the car. At the top the cars are pushed by hand to a dumping apron that chutes the material to steel gondolas of the same type used for handling the limestone. The shale for the older ordinary portland cement plant is hoisted up this same incline, but is dumped to crushers that are used only for the older plant.

The 50-ton gondolas after being loaded with shale are switched to the trestle that was built to serve the Velo plant, and from this steel trestle the shale or limestone cars can be dumped to the pan conveyor-feeders serving the hammer mills that are used for secondary limestone crushers, and for primary shale breakers.

The company owns between 100 and 125 of the side-dump Koppel cars. At the time of inspection several dozen loaded cars stood on a storage switch protected from the rain and snow by individual canvas covers.

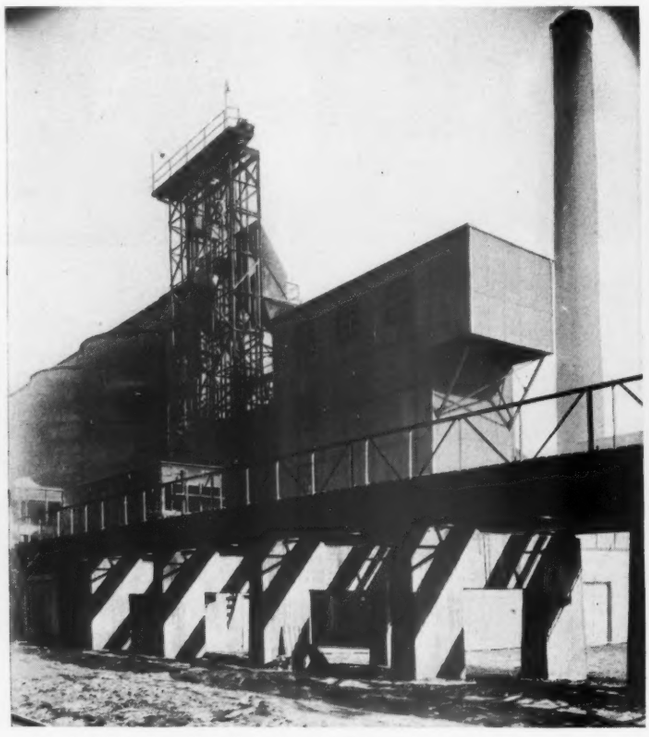
Clay-Pit Operation

The principal ingredients, of course, are limestone and shale, but for corrective purposes or to adjust the correct amount of lime, alumina and silica in the raw slurry a sufficient amount of a silicious clay is added in the form of a slurry. As the amount of this clay that is used is small, this material, which is in reality the stripping or overburden from the shale deposits previously described, is loaded into a 5-ton White truck by a Marion 60 steam shovel or the electric shovel used occasionally for loading shale.

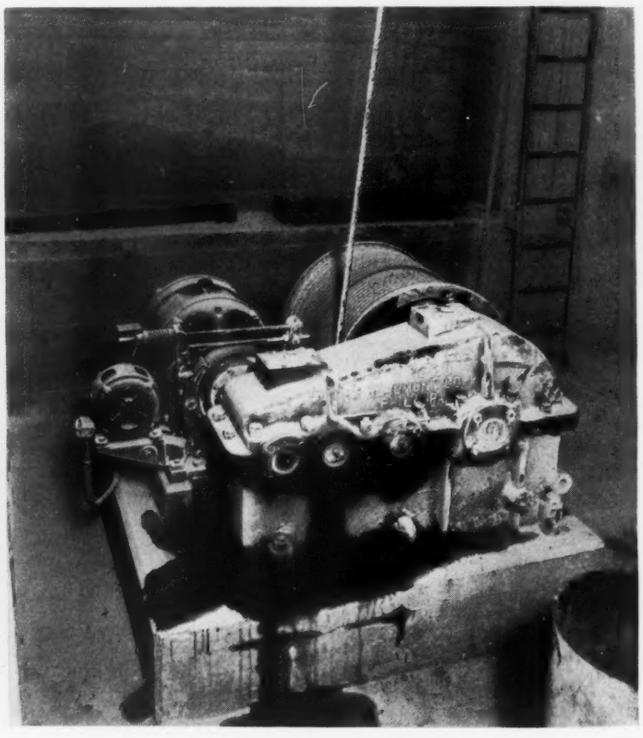
The clay is hauled up a short ramp at the north end of the plant and dumped direct to a F. L. Smidth clay washer, where water is added and the clay thoroughly disintegrated and formed into a slurry carrying 35% water. This mill is simply a mechanically agitated tank with a series of drags, chains and rabble arms that churn the clay mass to the desired physical condition. The mill is driven by a 12-in. Balata belt from a 40-hp. Westinghouse induction motor.

From the wash mill the clay slurry flows by gravity to a F. L. Smidth clay storage basin equipped with three vertical agitator shafts, all driven from a single 15-hp. Westinghouse motor through a type 7-D Falk gear reduction unit, 26.1:1, and a horizontal shaft, which by three pinions and gears drives the agitator rabble arms. This basin is a single reinforced-concrete unit with rounded ends and with a concrete top slab which serves as the floor for that portion of the mill.

The clay slurry after analysis is pumped as needed to three correcting basins, at right angles to the center line of the clay storage basins, and at a considerable higher elevation, by either of two 2-in. Wilfley pumps, each direct-connected to 15-hp. motors (1750 r.p.m.). The pumps are in the basement under the correcting tanks and alongside the clay basins.



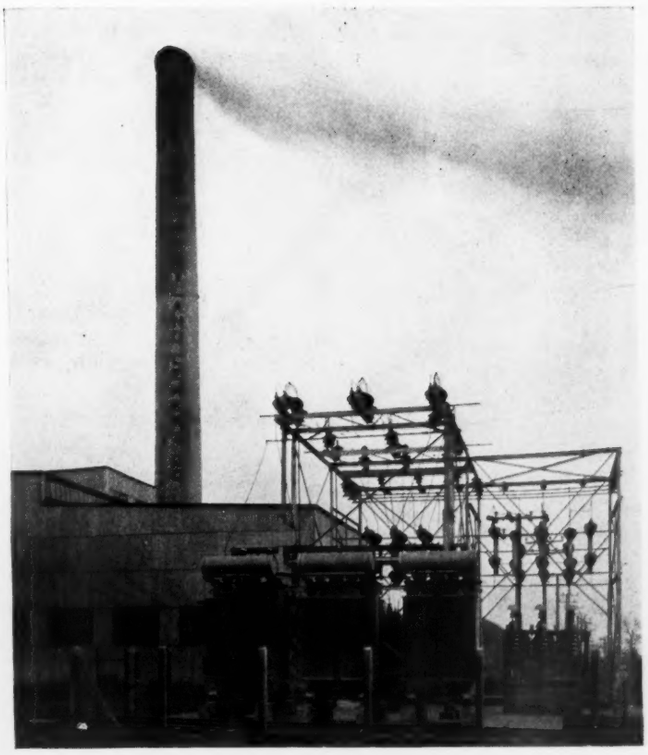
Balanced skip-hoist installation



Skip-hoist motor drive

Secondary Crushing Plant

The limestone and shale cars after being switched to the steel trestle that parallels the new plant are dumped to either of two concrete track hoppers, each of which is emptied by an individual, giant type, cast-steel, 48-in., Stephens-Adamson pan feeder that acts as a bottom for the track hoppers and feeds to the two hammer-mills. The pan conveyors are driven by individual 10-hp. slip-ring motors by means of enclosed gear reduction units.



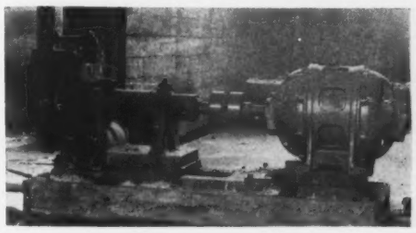
Stack and outdoor transformer

The two 5040, Dixie "Mogul," non-clog, hammer mills used are especially adaptable for crushing limestone and clay, especially of a wet or sticky nature and are provided with the usual type of movable breaker plate that moves counter clockwise, while the breaker hammers rotate clockwise. This feature tends to prevent sticking of otherwise troublesome material.

The hammer mills are each directly connected to 200-hp., 2200-volt, Westinghouse motors, 53.7 amp. per terminal and operate at 700 r.p.m. The breaker plates are driven by individual 5-hp. motors through James speed reducers, that operate the breaker plates at approximately 3 r.p.m.

The hammer-mill discharge falls to the small storage pockets that feed the skips used to elevate the crushed material to two rectangular concrete tanks. These tanks act as a surge, or temporary storage, between the skip hoist and the conveyor to the stone and shale silos. Each small storage pocket under its respective hammer mill holds the stone that is discharged from the mill while the skip for that particular mill is making the round trip. As the hoist makes this trip in about two minutes, the total capacity of the two bins is necessarily about ten tons. As the skip is lowered from its dumping position it drops vertically for the greater part of the distance, but at a point even with the mill floor line the guides make a gradual bend so as to bring the skip bucket to a point directly under the hammer mills. As the skip comes to its final resting place at the bottom of the shaft, the loader automatically trips and opens, allowing the accumulated material in the small storage pocket to fall by gravity into the skip. As the skip descends it automatically closses the loader, shutting off the flow of material. The skip hoists were designed and erected by the R. H. Beaumont Co., of Philadelphia.

These two rectangular skip buckets are operated by individual Beaumont hoists, but they are so regulated that one bucket is being loaded while the other is dumping. The No. 30 hoists are driven by a 40-hp., 1160-r.p.m., induction motor, operating the skips at a rope speed of 150 ft. per min. The hoists are controlled by an oil reversing switch and limit and a Cutler-Hammer mag-



Slurry pump installation

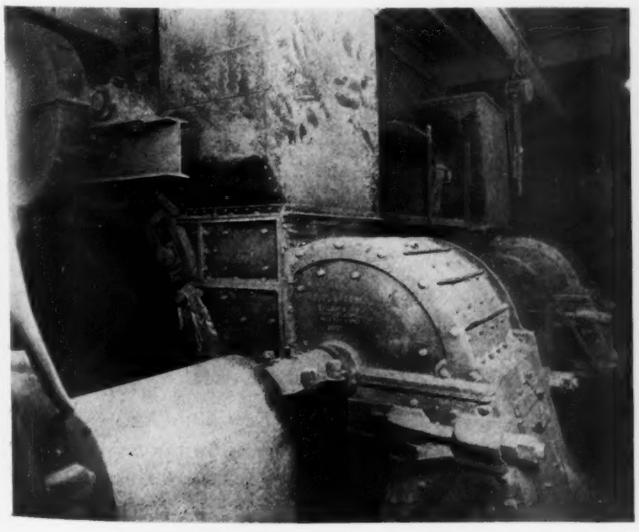
netic brake operated by a 440-volt, Cutler-Hammer motor, type R.S., size 14.

The self-dumping skips discharge to steel hoppers, and the material is chuted to one of two, or both, concrete surge tanks, 15x15x30 ft. 3 in., holding 264 tons each, that are located between the shale-limestone bins feeding the grinding units, and the shale and limestone storage silos. These two bins or tanks are merely to provide means of feeding the cylindrical cup conveyors that take the crushed stone to the storage silos or to the bins feeding the grinding mills.

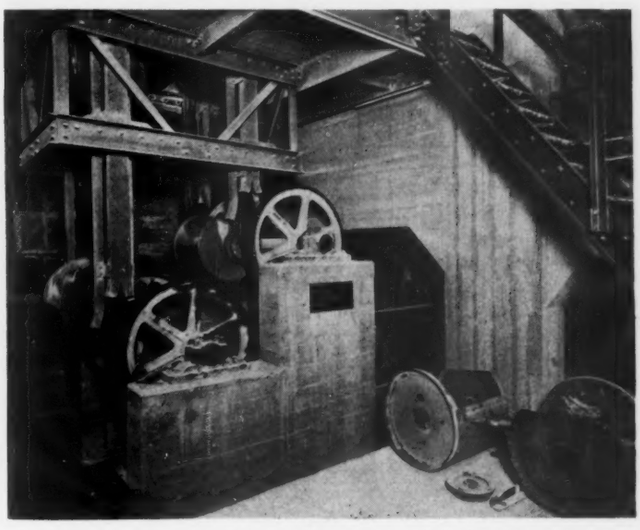
It is the practice at this plant to use both the hammer mills and skip hoists for one material at a time, and by storage, keep enough ahead so that there is no delay; for this reason the two bins must be emptied when changing from shale crushing to limestone or vice versa.

Feeding Raw-Grind Mills

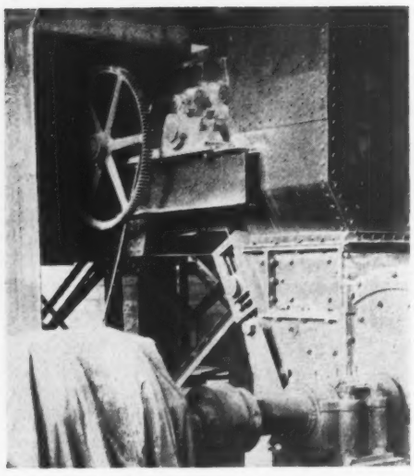
The conveying system used is one of the late developments of F. L. Smidth and Co.,



Hammer-mill secondary crushers

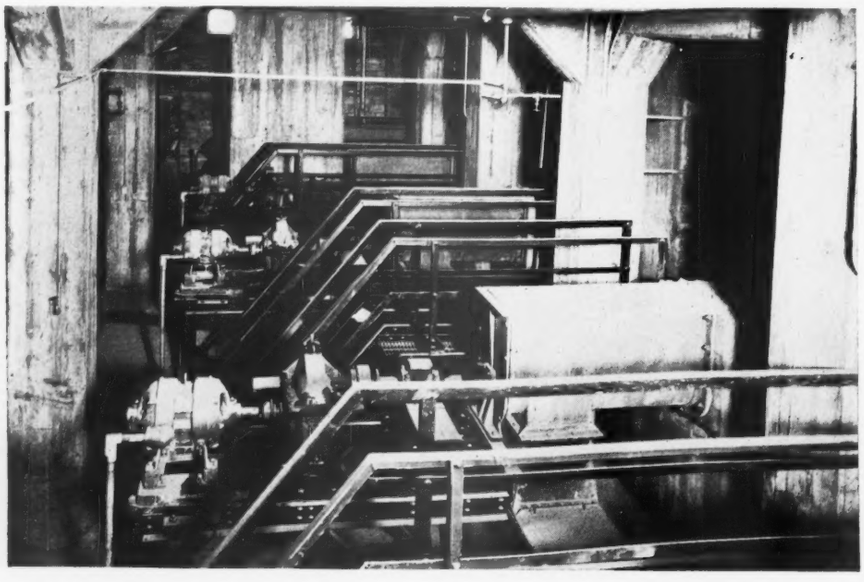


Part of the conveyor installation for raw materials



Pan feeder for hammer mill

and is referred to as the "Cylcup" or cylindrical cup conveyor, taking its name from the cylindrical shape of the buckets. The cups are loaded with either shale or limestone, or alternate cups can be filled with either limestone or shale, or any adjustment that is necessary can be made if desired. This type of conveyor is the first installation of its kind in America, although several



Conveyor installation for removing finished cement from silos

have been in use in Europe for some time.

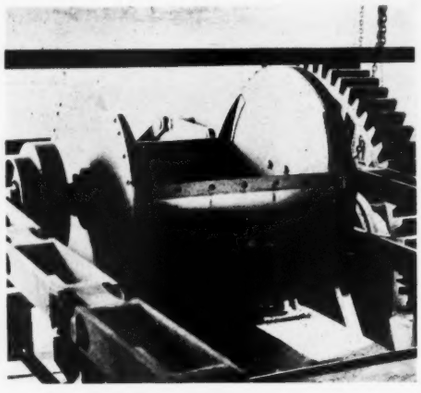
As the cups pass under the bins for loading a wheel mounted on an extended arm engages with a circular member of the cup, which trips the loading device bolted to the bottom of the bins at convenient distances, and a predetermined amount of stone falls into the cups. There are four of these loading devices under the surge bins, and one or all or alternates can be set to discharge to the conveyor system. Likewise there are eight of these loading devices spaced at 12- and 24-ft. centers under the stone and shale storage silos.

The Cylcup conveyor system on the raw end here performs four different operations simultaneously, or anyone or all the other three operations can be alternated or omitted according to the will of the operator. The system can (1) empty the temporary surge bins served by the Beaumont hoists, (2) fill either or both the shale or limestone silos, (3) empty either or both the shale and limestone silos, and convey the material to either or both the shale and limestone hoppers feeding the ball mills and (4) empty the surge bin conveying the material direct to the shale or limestone bins feeding tube mills.

At two places in the system the bucket line runs parallel and immediately above the other, these places being under the surge bins and over the mill-feed bins. Starting at a point under the surge bins the consecutive operation of the conveyor system becomes (1) loading cups and horizontal conveying to a shaft between rock silos and surge bins where buckets are elevated vertically to the tops of the stone silos. At this point they pass horizontally and can be dumped or allowed to continue over the top of the silos to the end of the building where they pass down a shaft to the conveyor tunnel under the silos. Here they return towards the surge bin, and at this point the two bucket trains parallel each other, one above the other.

The lower bucket line passes to a point between surge and mill feed hoppers, where they pass up a vertical shaft to the top of the mill-feed bins, and the conveyor again assumes a horizontal position as it passes over the tops of these two bins. The cup line, after dumping, passes to the end of the building where the bucket line passes over a large diameter return sheave that reverses the direction of the returning buckets and here again the two bucket lines are parallel to each other, one above the other, as the line passes back to the last vertical shaft referred to and descends. The descending bucket line parallels the upcoming buckets in this shaft, and the down-going buckets on reaching the bottom of this shaft pass under the surge bins, thus completing the conveyor circuit.

The cups are discharged by simply placing a wood rail at the desired point of dump, and as they are pulled over this rail the periphery of the cup contacts with this rail causing the container to revolve as a wheel dumping the contents. After passing off on this rail the bucket assumes its normal position, as the design is such that the empty buckets' center of gravity is below the central horizontal supporting shaft on which the cylinder swings freely.



Detail of new type of conveyor used for handlling raw materials

The cylindrical cups are all equipped with Alemite fittings for lubrication, which no doubt accounts for the small horsepower required to operate a conveyor of this size. The conveyor system is 640 ft. long and has a total of 107 buckets and is driven by a 20-hp. Westinghouse induction motor, 1160 r.p.m., through a type 10-D, Falk speed reduction unit of 69.5:1, which contacts with open gears reducing the speed further.

There are four reinforced-concrete cylindrical silos for storage of limestone and shale, it being customary at this plant to use three of the silos for limestone and one for shale. The silos are in a single line and are of the same size holding 3000 tons of stone each, or 2500 tons of shale. The silos are 60 ft. high and 35 ft. internal diameter.

There are two sets of hopper-bottomed steel bins that feed the two primary raw grinding units, each set being divided into two sections, one section for limestone and the other for the shale.

Raw Grinding

The first stage of the raw grinding is done by two "Unidan" mills, a type of compartment mill designed by F. L. Smidth and Co. for both the preliminary and final grinding. The two mills operate in parallel and the

Clay wash mill at right discharging to clay slurry storage tanks

slurries produced by these two mills, after correction with the silicious clay slip and mixing, is reground in a tube mill.

As the plant is designed to manufacture either Velo cement or ordinary portland the secondary grinding of the raw slurry is usually omitted for the ordinary portland cement, but for the production of the high early strength cement extremely fine grinding is essential.

One of the preliminary Unidan mills is much larger than its parallel mate, the first mill being rated as a 20-39, the second number indicating its length. The second mill is a 16-32.

The mills are fed from steel hoppers previously referred to, the shale and limestone outlets of the bins converging to two small outlets at the feed end of each mill. The feeders here receive the two materials and makes a rough, predetermined proportionate feed between the limestone and shale by means of two cradle feeders in conjunction with two quadrant cut-off gates connected together by a toggle arm, in such a fashion that at suitable intervals the mill's rotation causes the feeder to function, after which the quadrants both open, allowing the contents of the two cradles to discharge to the mill-feed scoops that are mounted on the extended shaft of each mill. The feeder is referred to as a combination cradle feeder. At this point sufficient water is added to bring the slurry to a suitable fluidity, which ranges from 33 to 35% water.

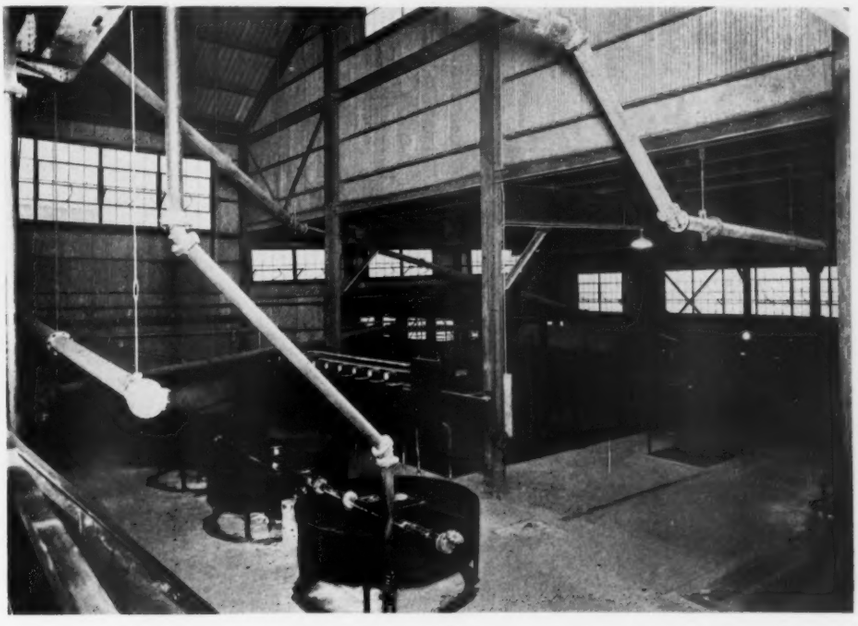
The larger Unidan (20-39) mill carries a charge of 97,000 lb. of grinding media. The smaller Unidan carries a charge of 50,000 lb.

The larger Unidan is driven by a 600-hp. synchronous motor, type HP, 2200 volts, 3-phase, 60-cycle, 127 amp., 55 field voltage, 131 field amp. and operates at 150 r.p.m. All the motors in the new plant were supplied by the Westinghouse Electric and Manufacturing Co., unless otherwise stated; and it might be said that by far the largest percentage of the motors are of that make. Also, the a.-c. motors are all designed for 60-cycle and 3-phase current, but the voltage depends on the rated horsepower and is either 440- or 2200-volt.

The smaller Unidan mill is driven by a type HP, 250-hp., 2200-volt, 53.5-amp., 55 field voltage, 64 field amp., and operates at 164 r.p.m. Both the motors are directly connected to the mills by an extended 8-in. shaft (approximately 10 ft. long) which, by a pinion and ring gear operate the mills at 20-21 r.p.m. One object of the extended shaft is to absorb the vibration incidental to sudden mill shocks.

Slurry Handling

The discharge slurries from the first Unidan mill are held at 90% minus 200-mesh. The product from the smaller mill flows through a short launder to a storage basin similar in design to that used for storage of the silicious clay slurry except that the storage basin has four instead of three sets of rabble or agitator arms. This basin's content can be, if desired, pumped direct to the correcting basin by one of two 2-in. Wilfley pumps, directly connected to individual 20-hp. induction motors operating

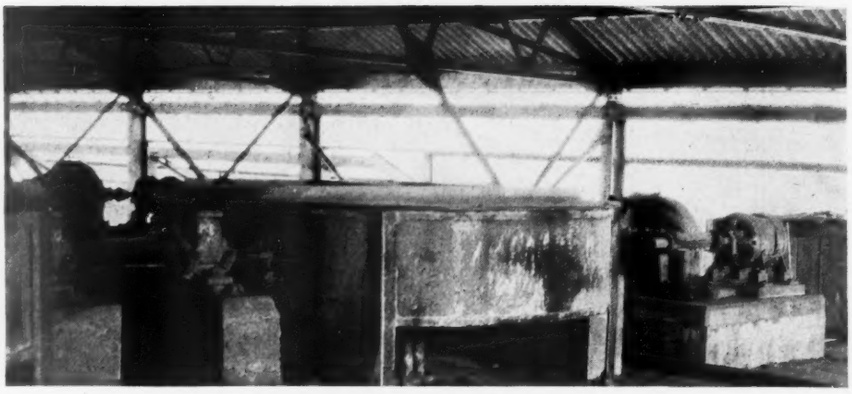


Tube mill in background for grinding Velo slurry, with slurry storage agitator drive mechanism in foreground

at 1750 r.p.m. Three of the sets of rabble arms are operated by a single 15-hp. motor through a Falk reduction unit, type 7-D, 26:1; and the remaining single vertical rabble arm by a 5-hp., type CS, 870-r.p.m. motor through a Falk reduction unit of similar characteristics.

The discharge from the larger Unidan flows by gravity to a small, rectangular, open-top, concrete sump that serves two 4-in. Wilfley pumps (one a stand-by unit) that deliver the slurry to the storage basin above referred to, or can deliver direct to the correcting basins. The discharge from the smaller Unidan can be diverted and made to flow by gravity to this sump if desired. Both pumps are directly connected to 40-hp. induction motors that operate at 1160 r.p.m. The suction and discharge lines of all the slurry pumps in the plant are equipped with the proper size Nordstrom lubricated plug valves. The Unidan storage basins hold 1600 bbl. (finished cement) in slurry.

The slurry from the storage basins, or from the small sump serving the Wilfley pumps, after complete chemical and physical analysis, is first pumped to a small rectangular measuring device where an approximate mixture is made with this slurry and the clay slurry that is similarly pumped from the clay storage basin to this measuring box. When the two slurries have been properly proportioned the contents flow by gravity to the correcting basins proper.



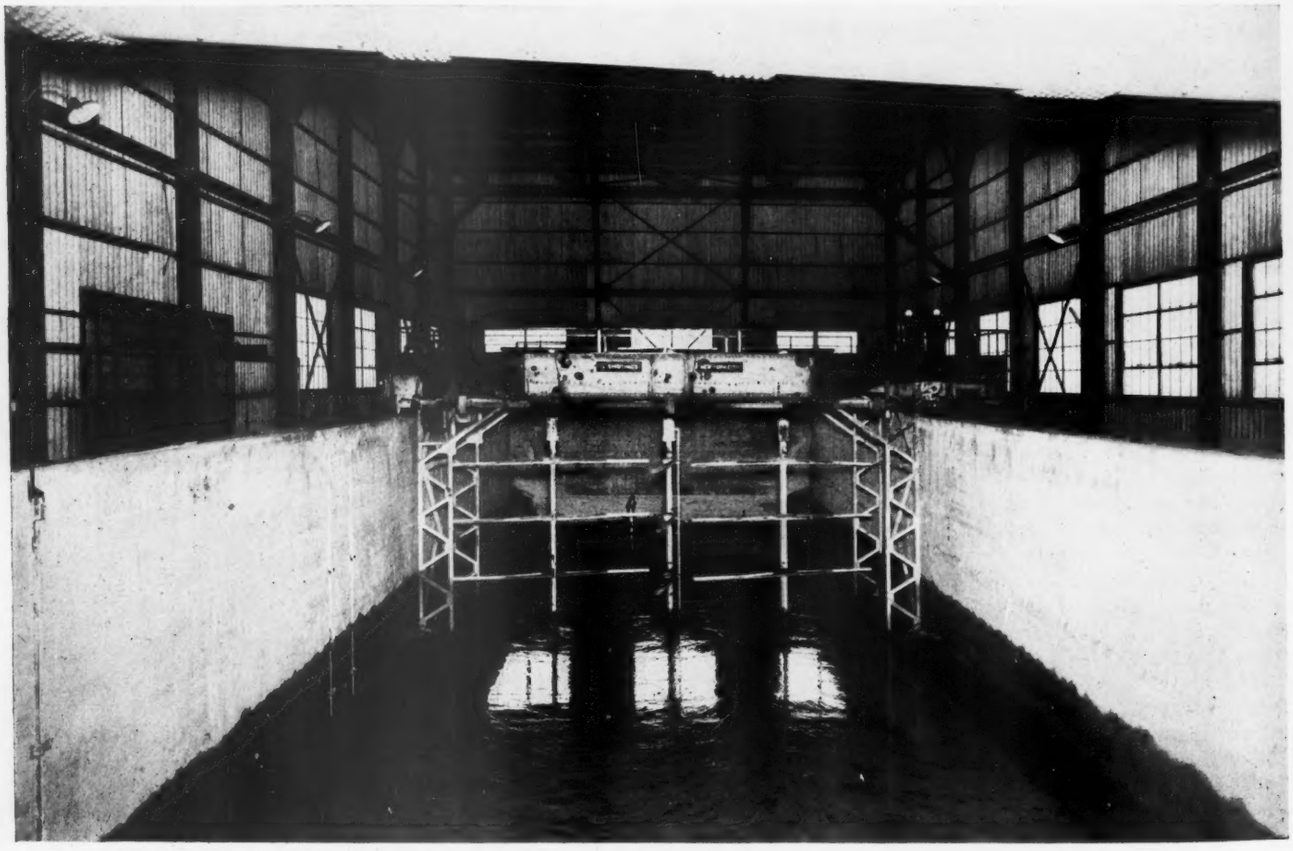
Agitator units on correction basins

There are three correcting basins, each holding 735 bbl., similar in design and method of agitation to those used in conection with the clay storage, but with only two vertical rabble arms, each driven by a 10-hp. type C.S., 1160-r.p.m., induction motors through Falk reduction units of 28.7:1.

Precautions to Insure Uniform Slurry

When a correcting basin has received a suitably sized charge chemical analyses are made and any corrections necessary are made by further additions of silicious clay and limestone-shale slurries; and when the composition, which is the company's secret, has been made to agree with the required formula to a degree of exactness that is humanly possible, the slurry flows by gravity to either of two mixing basins located one on each side of and parallel to the correcting basins. The correction basins use the two inner edges of the mixing basins as its foundation spanning an area between the two mixing basins and the basement thus formed is used as the pump house for the various pumps serving the clay, mixing and first Unidan slurry storage basins.

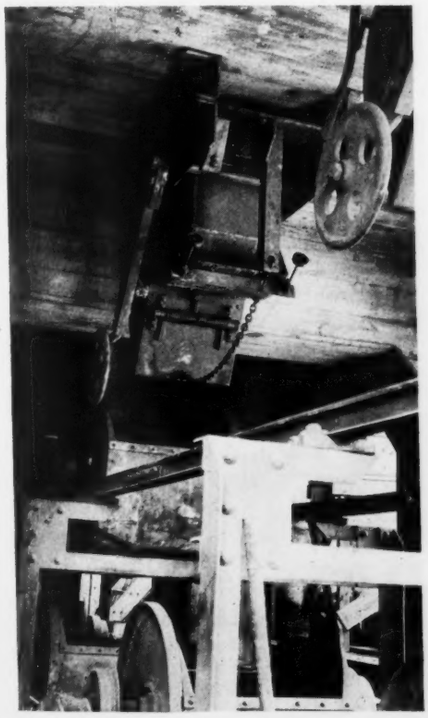
The contents of the mixing basins, if to be used for ordinary portland cement, are pumped by either of two 4-in. Wilfley pumps each direct-connected to 50-hp., 1160-r.p.m.,



Rectangular slurry storage basin with automatic traveling agitator

induction motors, to storage basins or to the kiln feed directly, bypassing the secondary grinding unit. If the slurry is for Velo cement the contents of one of the mixing basins is pumped to a tube mill feeder located on top of the correcting basins, while the second mixing basin is preparing the following batch. The mixing basins each hold 2425 bbl., or a total of 4850 bbl.

The tube-mill feeder is simply a small rectangular steel box equipped with a small ribbon conveyor for agitation, the discharge of the feeder being a gate valve; the flow is regulated by means of this simple method.



Automatic gate for filling cylindrical cup conveyor. Wheels on each side function to open and close gate

The ribbon conveyor is driven by a 5-hp. motor through a DeLaval worm gear reduction unit. To learn the rate of flow to the tube mill the valve's discharge can be completely bypassed to a measuring pocket, and by means of a stop watch, the gallons per minute of slurry flow can be determined. This rate of flow is regulated so that the resultant tube-mill discharge will have a fineness of 97% minus 200-mesh, at which fineness the Velo cement slurry is delivered to the kilns. The pump serving the feeder is of greater capacity than the tube-mill feed, and as a result the rectangular box is kept at constant level and the excess overflows back to the mixing basin from which it came.

To deliver the slurry to the tube mills two 4-in. Wilfley pumps, direct-connected to 50-hp., 1160-r.p.m., induction motors are used. (One is a stand-by unit.) These sets of pumps require more power than any of the others owing to the higher elevation this slurry must be pumped.

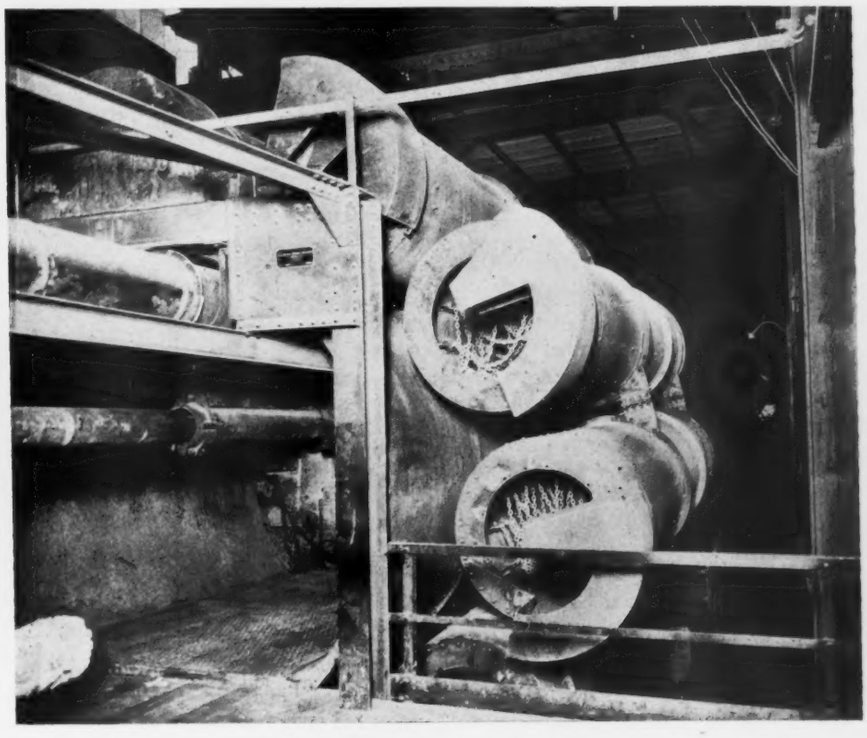
The tube mill used for secondary grinding is a No. 20 F. L. Smidth and Co. mill operating at 20 to 21 r.p.m., carrying a load of 63,000 lb. of "Cylpebs," and is driven by a 450-hp. synchronous motor, 2200-volt, 95.5-amp., 55 field volts, 102 field amp. and at 150 r.p.m. The motor is direct-connected to the tube mill by an extended horizontal shaft, as are the two Unidan mills, and speed reduction is obtained through a pinion and ring gear.

The tube mill discharges by gravity through a short launder to a storage basin equipped with three vertical rabble arms, of the same design as that used on the mixing and correction basins. The rabble mechanism is powered by a 15-hp., 1160-r.p.m. motor through a Falk speed reduction unit 26.1:1. The rabble arms on all the storage and correction basins operate at 4 to 5 r.p.m., and this additional reduction in all cases is obtained through enclosed pinion and gears. This storage basin has a capacity equivalent to 1460 bbl., and discharges through a syphon to the rectangular storage basin directly alongside of and parallel to this, which is referred to as an emergency slurry storage basin.

The syphon referred to is so designed that the input leg extends to the bottom of the emergency basin and helps to maintain a uniform "solids to liquid ratio" of the slurry; one can readily see that if this basin discharged from the top by overflowing there would be a decided tendency for the solids to settle, allowing a clear or semi-clear solution to overflow. The contents of this basin are again sampled as a check and complete physical and chemical analysis made to insure a uniform and absolutely correct kiln feed.

Slurry Kiln Feeding

The rectangular slurry basin has a capacity equivalent to 10,300 bbl. of finished cement and is provided with the usual F. L. Smidth and Co. self-reversing, three vertical sweep, traveling agitator supplemented with air agitation. The agitator arms are driven by a 10-hp., type CS, 575-r.p.m. motor through a Foote Bros. Gear and Machine Co.'s type D-20-14 speed reduction unit 12.6:1. The rabble arms speed is further reduced to about 5 r.p.m. by enclosed gears. The traveling mechanism is driven by a type CS, 7.5-hp., 575-r.p.m. induction motor through a right-angled Cleveland Worm and Gear Co., gear reduction unit, size 500-RT, 49:1, with further speed reduction through a chain drive to the wheels which carry the agitator.



Cooler end of kiln showing chains

The slurry from this basin is pumped by one of two 4-in. Wilfley pumps, each direct-connected to a 40-hp., 1160-r.p.m., type CS induction motor, to the F. L. Smidth and Co. kiln slurry feeder, the pumps delivering an excess which flows by gravity back to this storage basin.

The feeder is somewhat similar in appearance to a water turbine and each radial arm, as it is revolved by a 2-hp. d.-c. variable-speed motor, scoops up a bucketful of slurry. As the arms raise out of the pulp,

the slurry discharges towards the center of the radial arm's hub, which is hollow, allowing the slurry to flow out through the hollow driving shaft to the pipe feeding the kiln. The rate of flow can be regulated by the depth to which the scoop arms extend into the slurry and by the r.p.m. of the feeder, the r.p.m. being synchronized with the direct current, variable-speed motor driving the kiln, so that any reduction in speed of the kiln effects a corresponding reduction of rate of kiln feed.

The dust accumulating in the breaching between kiln feed end and stack is fed back into the slurry and the dust thus passing back into the system. The dust is elevated from the steel hoppered flues by a small enclosed bucket elevator driven by a 10-in. motor operating at 1160 r.p.m., and speed reduction is obtained through a Falk herringbone gear reduction unit, type 6D, which has a 18.6:1 ratio of reduction.

The Kiln

The Velo plant has one of F. L. Smidth and Co.'s "Unax" kilns equipped with a cooler consisting of a number of tubes mounted on the periphery of the kiln proper and parallel to its center axis and at the kiln's discharge end. The name "Unax" is the trade name given this type of kiln. The kiln is 11 ft. 3 in. by 10 ft. by 311 ft. long and is lined with four grades of high refractories supplied by several different manufacturers. The upper part of the kiln is insulated with a 2½-in. thick "Moler" lining. The Moler bricks were furnished by F. L. Smidth and Co.

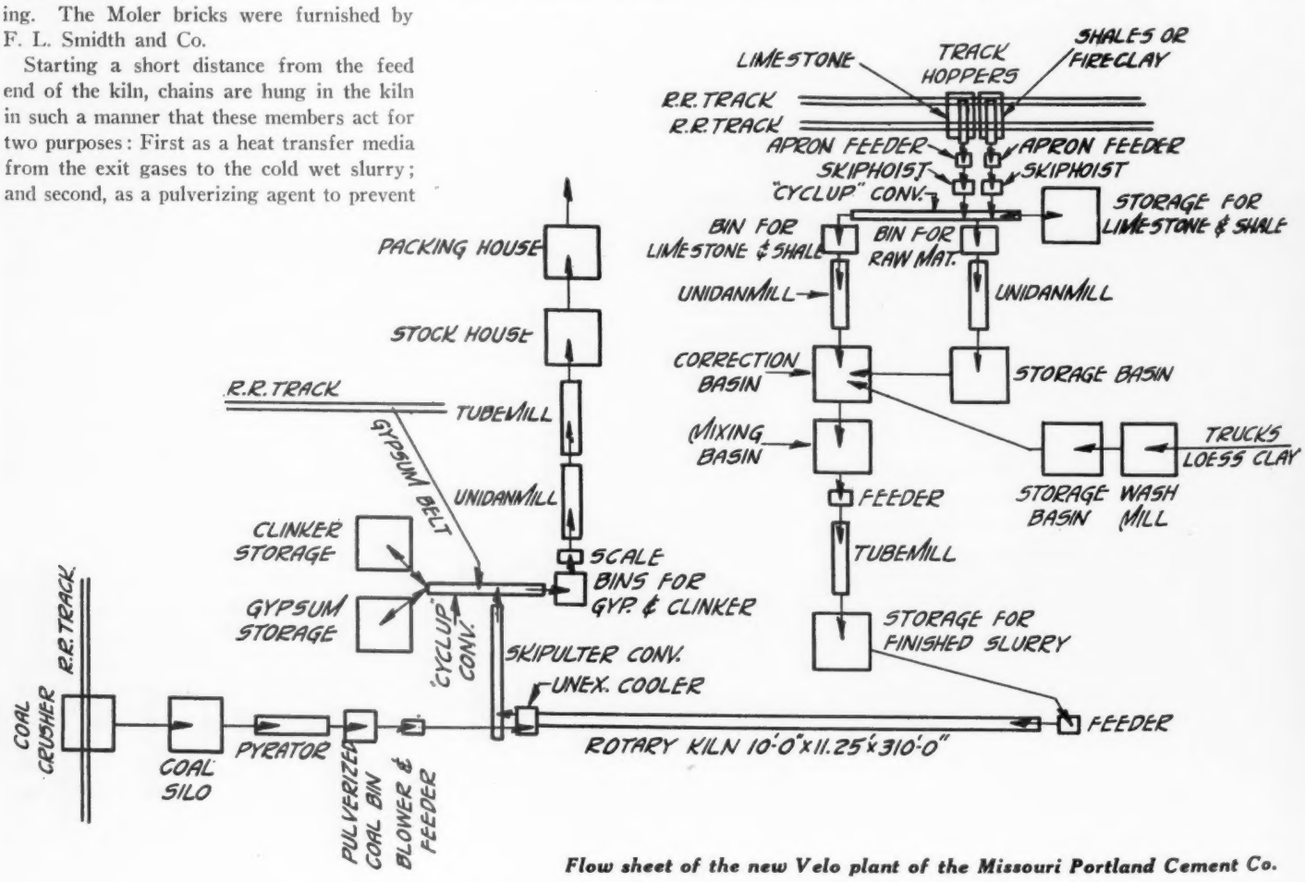
Starting a short distance from the feed end of the kiln, chains are hung in the kiln in such a manner that these members act for two purposes: First as a heat transfer media from the exit gases to the cold wet slurry; and second, as a pulverizing agent to prevent the gradually drying slurry from forming balls or kiln accretions. The kiln is placed at an inclination of ½-in. per ft., and normal operation calls for one revolution per minute with ordinary portland cement and for Velo cement one revolution per 2½ min. can be secured by the variable speed, d-c. motors driving the kiln. The kiln has four tires mounted on rollers equipped with oil lubricated bearings, there being two rollers to each kiln tire; thrusts are stabilized by one set of thrust-bearing rollers, one on each side of the tire alongside of the main drive ring gear. The kiln itself was supplied by Traylor Engineering and Manufacturing Co., and the cooler, hood, etc., were supplied by F. L. Smidth and Co.

The kiln is driven by a Westinghouse type SK, d.-c., variable-speed motor rated at 50-100 hp., 230-volt 187/374-amp., 400/1200-r.p.m., through a Falk, type 10-D, speed reduction unit 11.6:1; and two additional sets of enclosed gear reduction units, the driven member of this last set serving the kiln-ring gear proper.

The ten tubes of the "Unax" cooler are all supplied with the usual chain heat transfer units by means of which the clinker is cooled and this heat transferred to the air passing to the kiln. The chains can be readily seen suspended in the coolers in the illustration. The coolers are each 12 ft. long and cool the clinker to approximately 175-deg. F. For repair purposes, a 7-ton, hand-operated, Cleveland chain hoist, mounted on two tracks and a cross carriage is constructed over and spans the cooler.

The kiln gas temperatures are indicated and recorded by a Leeds and Northrup pyrometer of the potentiometer type, with the hot points located at the base of the stack and the temperature recorded at this point standardized against that of the kiln proper, which is maintained at 2600-2700 deg. F. This instrument is located on the master control panel near the kiln discharge end; and from this instrument regular readings are recorded by the kiln operator. A graphic recording instrument is located in the plant manager's office. On the same panel as well as another located near the base of the stack are mounted Ellison inclined indicating draft gages for regulation of the kiln discharge gases.

The kiln is fired with pulverized coal, the coal being received in the kiln room by a hopper-bottom, steel bin, which is served by an F. L. Smidth and Co. "duplex" coal feeder arranged in the bottom of the bin delivering the pulverized coal to the coal pipe. The air required for carrying the pulverized coal to the kiln is delivered by a Buffalo Forge Co.'s type R, Size 53, steel plate, pressure blower which is direct-connected to a 40-hp., type SK-DC, variable-speed, direct current motor. The coal feeder is driven by a type SK-DC 5-hp., 230-volt, 20-amp., 600/1800-r.p.m., variable-speed, direct-current, motor through a Falk, type 4D, (13.3:1) speed reducer. The fan



Flow sheet of the new Velo plant of the Missouri Portland Cement Co.

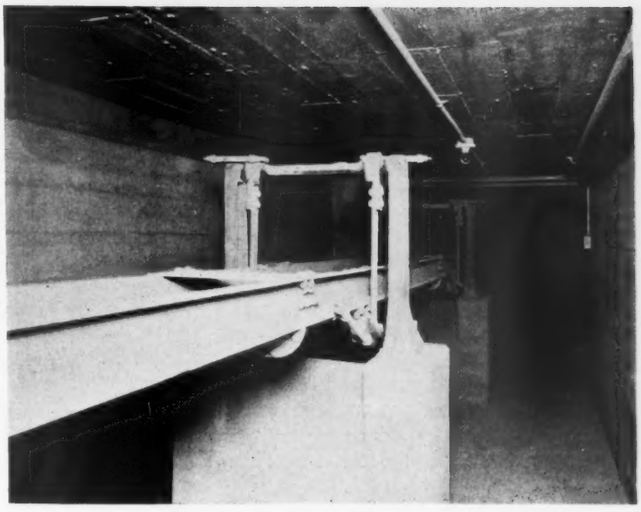
takes the hot air from the jacket surrounding the front end of the kiln through a 16-in. diameter horizontal suction pipe and returns the air and coal to the burner through an 8-in. pipe.

The water from the kiln, water-cooled bearings and the kiln-fan bearings as well as any seepage or drainage in the kiln room, drain to a sump and are pumped out against a 62 ft. head. A similar pump is also used in the clinker grinding room to handle the water from the grinding-mills bearings and mill water jacket.

Clinker Handling

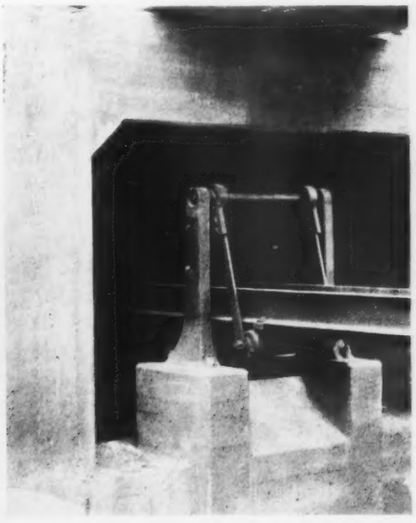
The "Unax" cooler discharge is by an F. L. Smidth and Co. "Skipulter," or shaking conveyor, at right angles to the axis of the kiln. By this conveyor the clinker is delivered to a second Cylcup conveyor similar to the one described in connection with the shale and limestone handling. The Skipulter is driven by a 15-hp., 575-r.p.m., induction motor through an enclosed silent chain drive, and operates the conveyor at approximately 100 reciprocations per minute. On this basis, the skipulter will handle 330 bbl. of cement clinker per hour. Alemite lubrication is also used on this piece of equipment.

The Cylcup conveyor receiving the clinker also serves as a means for elevating the gypsum to the three interstice bins that are a part of the four-in-line clinker silos. The gypsum and clinker are fed to separate pan cups here by loading devices similar to those previously described, and these materials can be fed to any desired number of buckets, consecutively or alternately. It is not to be inferred that the gypsum and clinker are fed to the same buckets, as these two are later mixed, but this is simply a single conveyor handling two different products at the same time and keeping them separate as well.



Clinker conveyor for Velo clinker

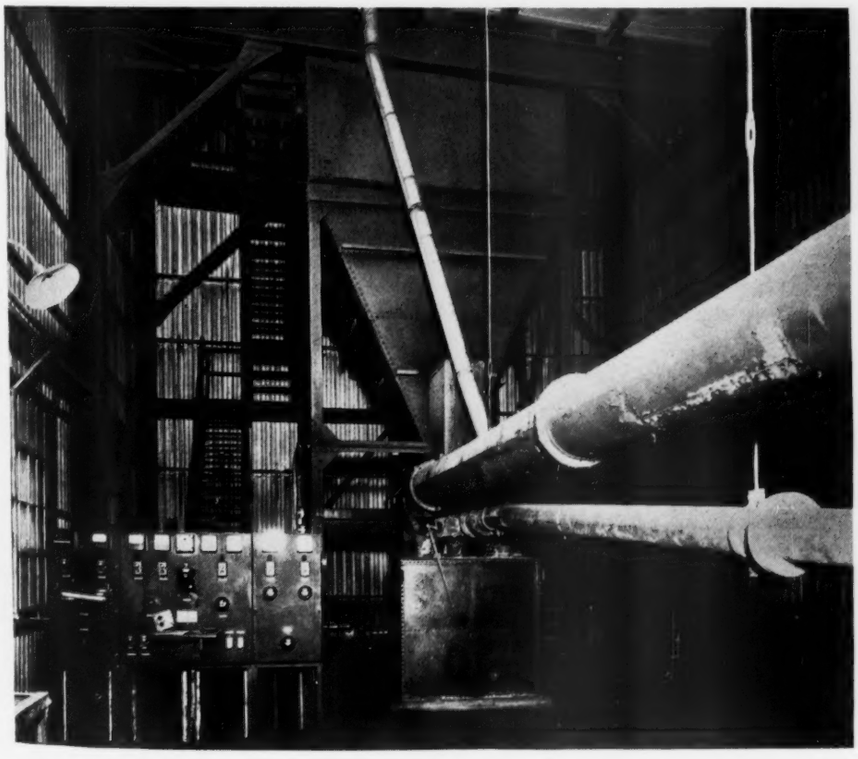
The conveyor after receiving the gypsum and clinker passes horizontally to a vertical shaft where the buckets are elevated to the top of the clinker silos and pass over the tops of these bins horizontally where the materials are discharged to the proper bins. If desired, the products need not be dumped at all as any number of buckets of each or both materials can be dumped, the remaining filled buckets and empties passing to the end of the building to a second shaft where the bucket line descends vertically to the reclaiming tunnel under the silos. At this point the system again assumes a horizontal position and, by means of feeders, the cups can be refilled with clinker or gypsum from the storage bins for transportaton to the bin feeding the clinker-grinding mills. The conveyor, as it passes through the reclaiming tunnel is traveling towards the Skipulter at which point the returning bucket line passes under and is parallel to that portion of the conveyor being filled with clinker. After passing to a point a short distance beyond the



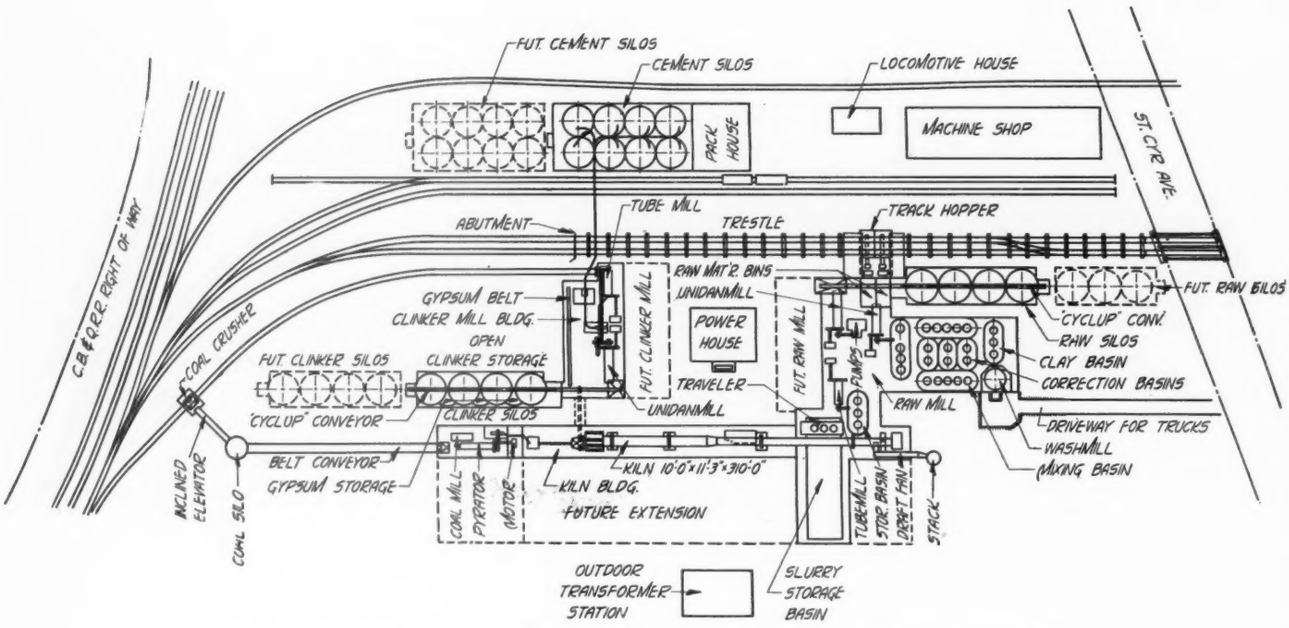
Detail of conveyor mechanism

Skipulter the bucket line passes vertically up a shaft at the top of which the conveyor flattens out again over the gypsum-clinker mill feed bin where these materials are discharged. The empty cylinders now pass to the end of the building and by means of a large diameter return sheave, the bucket line returns towards the Skipulter paralleling and above the filled cup line to that point which completes or closes the circuit.

This conveyor is driven by a 20-hp., 1160-r.p.m. induction motor through a Falk (69.5:1) reduction unit and additional enclosed gears which reduce the speed of the conveyor to such that the round trip is completed in 11 minutes. The conveyor



Coal feeder mechanism for kiln. The large pipe is taking hot waste gases from the kiln



General plan of the new Velo cement plant of the Missouri Portland Cement Co.

system is 670 ft. long.

During ordinary operation one cup will be used for gypsum to 16 for clinker.

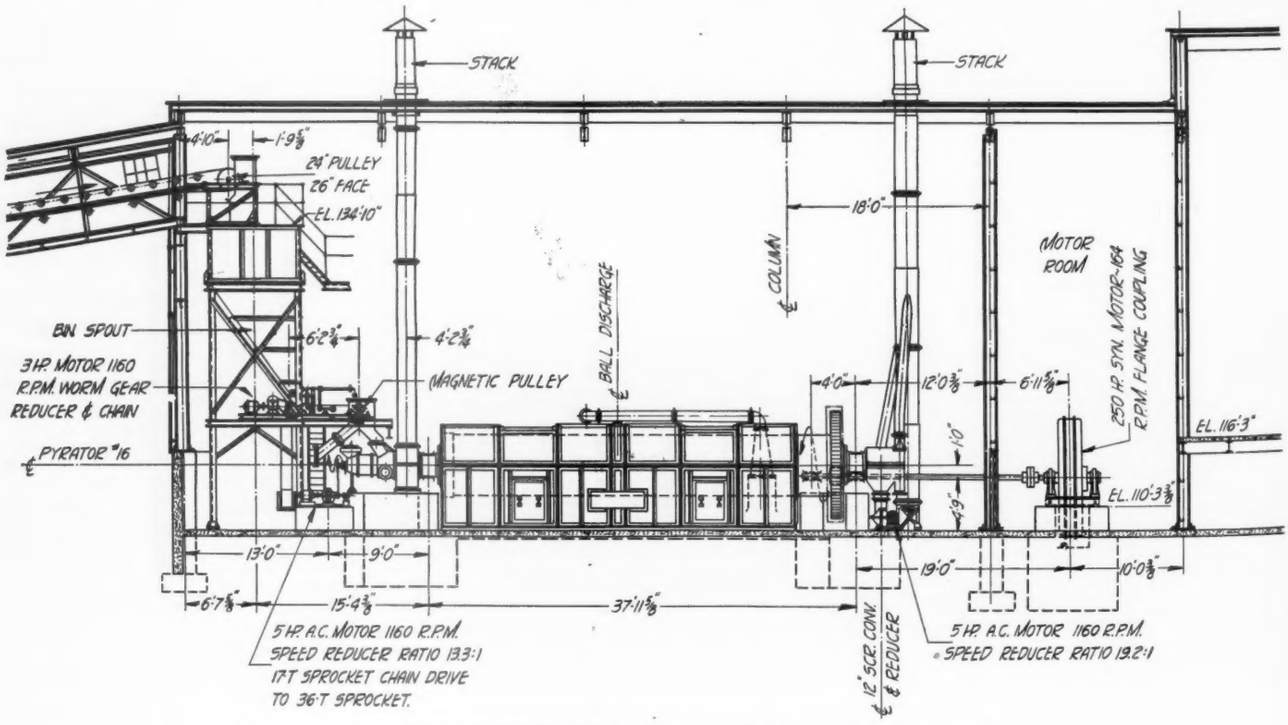
Clinker Silo and Reclaiming System

There are four reinforced-concrete clinker silos 35 ft. diameter and 60 ft. high, placed in a line, and the three interstices on one side have been walled off for gypsum storage. If desired the clinker can be chuted to outside storage alongside the silos, and this material is reclaimed by another chute that serves the Cylcup conveyor in the reclaiming tunnel. The clinker silos hold 14,400 bbl. of cement equivalent and the gypsum-bin interstices 130 tons each, or a total of 57,000 bbl. cement and 390 tons of gypsum.

The Cylcup conveyor, when delivering clinker and gypsum to the grinding mills, discharges to a steel tank holding an equivalent of 1100 bbl. of cement, and this tank has a small compartment for gypsum holding 86 tons. These two tanks feed direct to Richardson "Weightometers," which automatically weigh out both the gypsum and clinker in correct and pre-determined amounts. These machines are said to have an accuracy in weighing and proportioning that shows no variation at any time of over 0.5%. Each unit uses a General Electric motor, 2-hp. and speed reductions are by means of Foote Bros. reduction units.

Finish Grinding

The clinker, after the addition of the gypsum, passes by gravity to a No. 20-39 Unidan mill. A method patented by F. L. Smidth and Co. is employed for cooling the cement during the grinding. This mill car-



Coal pulverizer and dryer—longitudinal section

ries exactly the same load of balls as described in connection with the No. 20-39 (wet) Unidan mill and likewise operates at 20-21 r.p.m. The Unidan mill grinds the clinker to 82% minus 200-mesh. It is driven by a 600-hp. synchronous motor of the same characteristics of the motor used on the larger wet Unidan mill.

When the Velo plant is being used for the manufacture of ordinary portland cement no further grinding is necessary and this mill's discharge is received by a 6-in. Fuller-Kinyon pump and sent to the portland cement silos, but for production of the high early strength cement additional grinding is essential and for this purpose a second tube mill is used.

In this process, then, the first mill discharges to a short 16-in. screw type conveyor (driven by a 5-hp., 1160-r.p.m. motor through a Falk gear reducer, 19.2:1) set below and at right angles to the Unidan and this conveyor can in turn discharge to a similar cross conveyor. For making Velo the first screw conveyor discharges to a 6-in. Fuller-Kinyon pump that pumps the cement to the regrinding mill. This pump is driven by a 25-hp., 870-r.p.m. induction motor.

The second tube mill (No. 20-24) is similarly provided with a patented cooling device as mentioned above. It is loaded with 63,000 lb. of Cylpebs. This mill's r.p.m., and motor (450-hp.) is the same as the No. 20-24 wet tube mill.

The discharge product from the regrinding tube mill falls to the cross conveyor referred to above. This conveyor is provided at one end with right-hand flights and on the other end with left-hand flights, and delivers the finished cement towards the center to a 5-in. Fuller-Kinyon pump in a shallow pit below the conveyor discharge. This conveyor is parallel to and alongside of the center line of the Unidan and tube mill. The two grinding mills center lines approximately coincide. As a result of the arrangement the cross conveyor can deliver finished Velo cement to the Fuller-Kinyon pump from the tube mill by the right-hand flights, or when making ordinary portland cement, can deliver that product to the same pump by the left-hand conveyor flights. This conveyor is driven by a 10-hp. induction motor 1160 r.p.m. through a DeLaval worm gear reduction unit, 19:5:1. The screw conveyors in the clinker department and the gypsum belt conveyor were supplied by Jeffrey Manufacturing Co.

The Fuller-Kinyon pump for delivery of finished cement to storage silos is driven by a 50-hp., 870-r.p.m., Westinghouse type Cs, induction motor. This pump delivers the cement a vertical distance of 83 ft. and a horizontal distance of 194 ft.

There are eight reinforced-concrete silos arranged in two adjoining rows of four silos each which with the three star interstices thus formed have a total capacity of 125,000 bbl. of cement. The silos have an internal diameter of 32 ft. and are 70 ft. high.

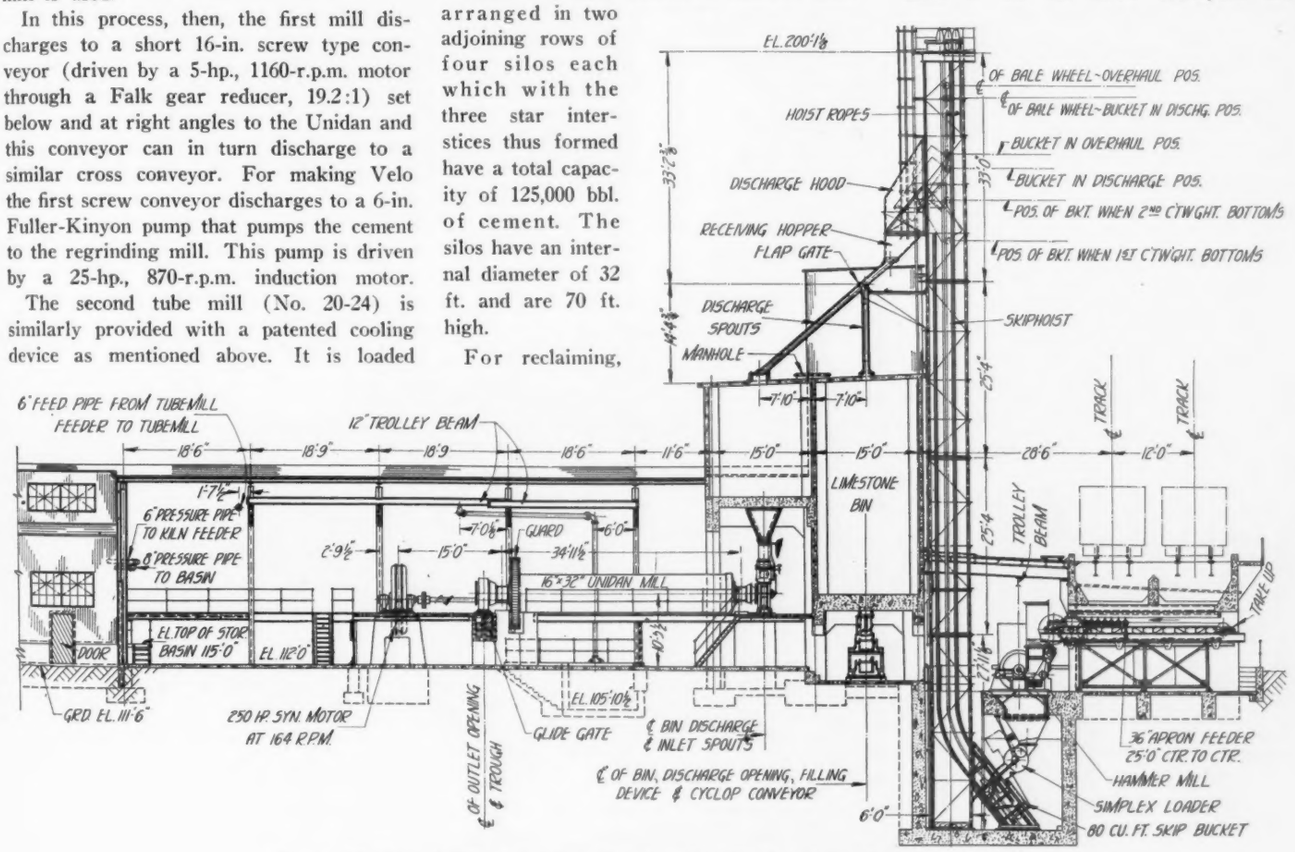
For reclaiming, there are six parallel tunnels under the silos, and these tunnels run parallel to an imaginary line connecting the centers of the four circles formed in plan by these silos. In each tunnel is a 16-in. screw type conveyor that rests on the bottom of the tunnel floor and this conveyor is served by an F. L. Smidth and Co. "Exbiner."

Straddling each conveyor is an industrial track running the entire length of each tunnel which serves as a track on which to move the Exbiner to any of the 15 rack and pinion gates that are supplied each tunnel. The gates are bolted to the bottom of the silos at regular intervals of about 15 ft. There is only one Exbiner used, and it is moved from tunnel to tunnel by cross-track and transfer car that runs at right angles to the six main tunnel tracks. The cross tunnel is located at the opposite end of the structure from the conveyor's discharge end. The short screw conveyor of the Exbiner is driven by a 5-hp., General Electric motor.

The operation of this device consists of moving the apparatus to a gate and by means of a cam or toggle the receiving hopper of the Exbiner is forced against the faced flanges of the rack and pinion gates. The short, non-flooding conveyor's discharge is then connected with the 16-in. screw conveyor housing by a canvas tube, after which opening the gates and starting the motor, the bin unloading proceeds.

Each of the six screw conveyors are driven by individual 15-hp., 1160-r.p.m. induction motors direct-connected through Falk (18.6:1) speed reduction units. These conveyors discharge to a 16-in. cross conveyor, that is also driven by a 15-hp., 1160-r.p.m. induction motor through a Falk (26:1) reduction unit and a chain drive, as the motor is mounted on a steel, elevated platform over the end of the cross conveyor.

This cross conveyor has also a right and left hand set of flights, as five of the tunnel conveyors deliver to the right-hand-flighted section and the sixth conveyor to the left-hand-flight section. The delivered products converge and fall to the foot of a bucket elevator, enclosed in a reinforced-concrete housing, which delivers the cement to a



Raw mill—longitudinal section showing details of balanced-skip installation

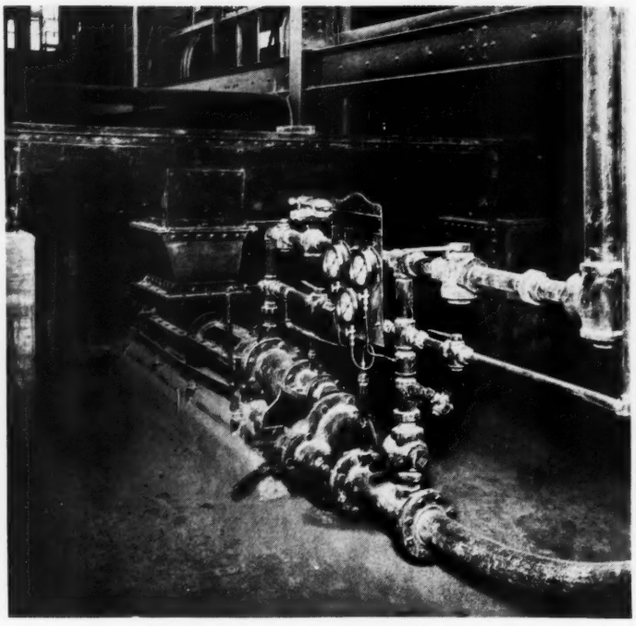
screen and conveyor ahead of the sacking machines. This elevator is driven by a 30-hp., 870-r.p.m. induction motor at the head pulley through a Falk (25.3:1) reduction unit.

The bucket elevator discharges to a small enclosed, rotary screen, ⅛-in. mesh wire cloth, which serves to remove any lumpy or foreign material from the cement, and this short screen discharges the cement into a short 16-in. screw conveyor delivering to the two steel, hoppered bins that serve the two three-tube Bates packers. Velo is packed in paper sacks only, 94 lb. per sack net. The rotating screen is driven by means of a chain drive from the elevator head pulley's extended shaft, and the screw conveyor is driven by a 5-hp., 1160-r.p.m. induction motor through a right-angled De Laval (19.5:1) reducer. The method of setting and operating the Bates packer can be seen from the illustration. These machines are each driven by direct-connected 20-hp., 1160-r.p.m. induction motors.

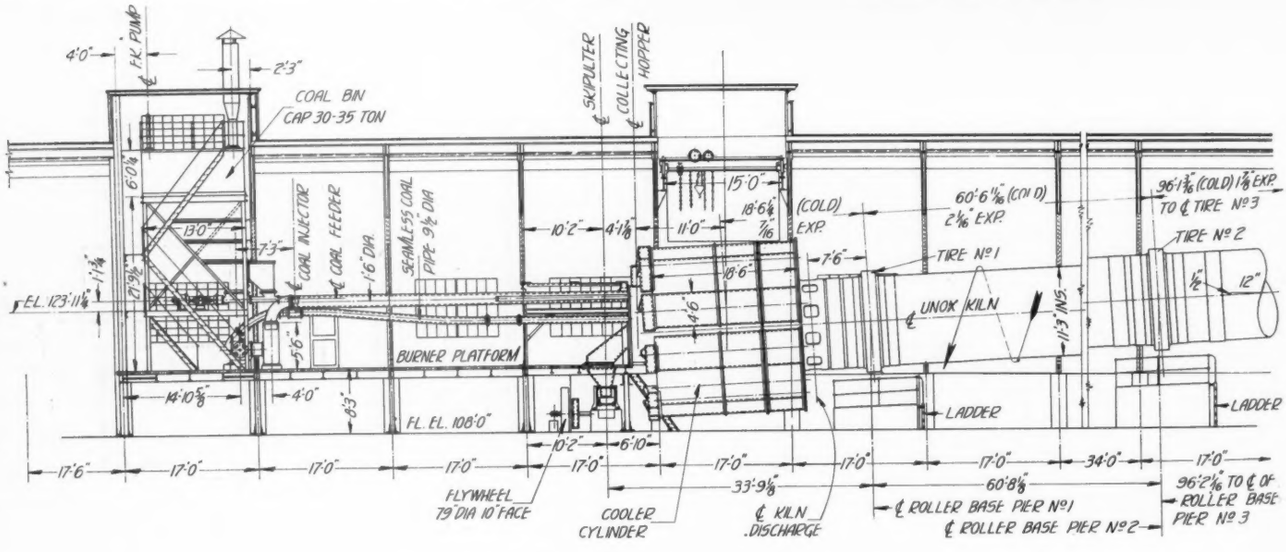
The spill from the packers falls to a 12-in. conveyor that handles the spill from the sackers. The knocker-screen and a short screw which is a part of its discharge mechanism is driven by a 2-hp., 870-r.p.m. motor through a No. 40, D. O. James Manufacturing Co., reduction unit.

Gypsum Handling

Gypsum is delivered to the plant, crushed to minus ¾-in., in box cars and is unloaded by wheelbarrows and dumped to a horizontal, 16-in. belt conveyor that delivers the gypsum to



Cement pump installation



Firing end of kiln and cooler—longitudinal section

screw conveyor, located in the basement under the sackers, which serves both of the sacking machines. This conveyor discharges to the foot of the bucket elevator previously described. This conveyor is driven by a 5-hp., 1160-r.p.m. induction motor through a Falk (19.2:1) speed reducer.

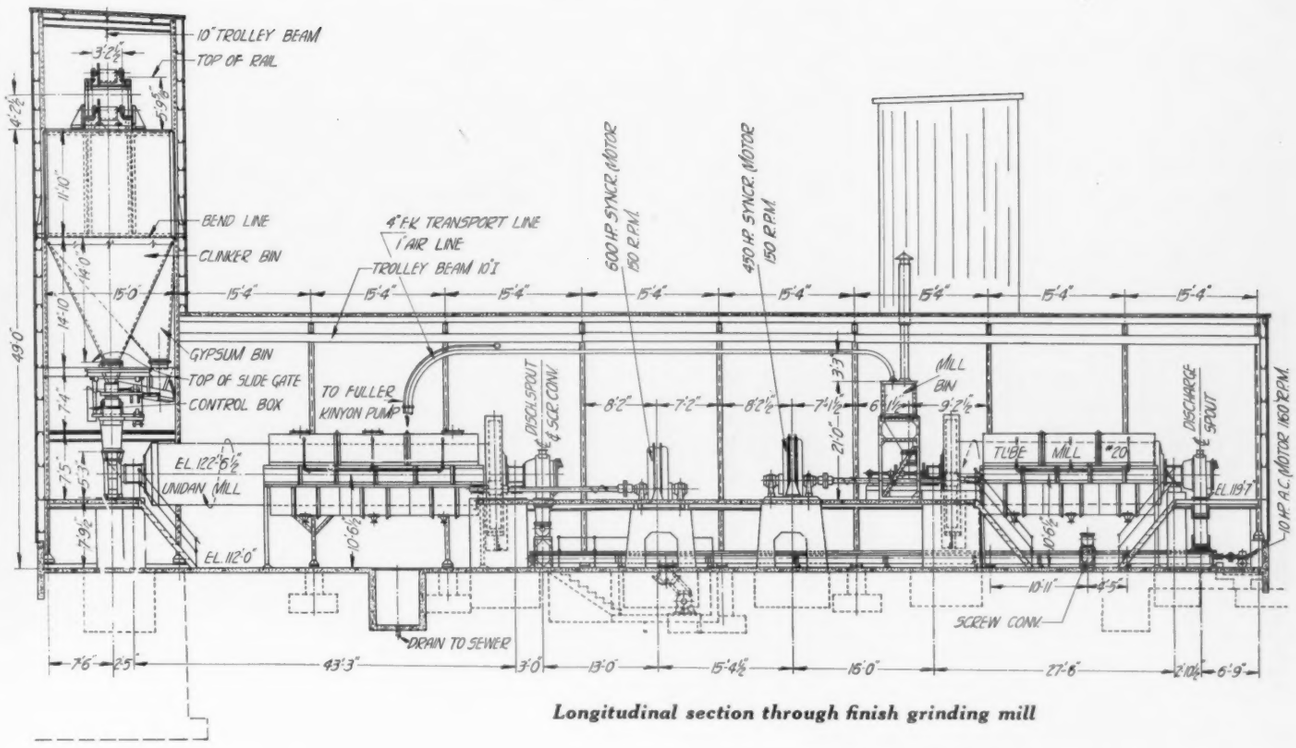
The dust from the sackers is picked up by the suction of a No. 45, type SP, Clarage exhauster driven by a 10-hp., 1160-r.p.m. induction motor, direct-connected. This fan's suction, by means of a header and a multiplicity of smaller pipes serves to gather the dust from elevator, screens, etc., and the dust is then blown to one of the Dust Recovery, Inc., dust collectors. The collected dust falls through a spout to a knocker-screen to remove any collected foreign matter, after which the cement is chuted to the Cylcup conveyor serving the gypsum silo interstice storage bins. The bucket elevator is driven by a 5-hp., 570-r.p.m. induction motor at the head pulley through a Falk (18.6:1) type 60, reduction unit. The belt conveyor is driven by a 5-hp., 670-r.p.m. induction motor through a right-angled, De Laval speed reducer (30:1).

Coal Handling

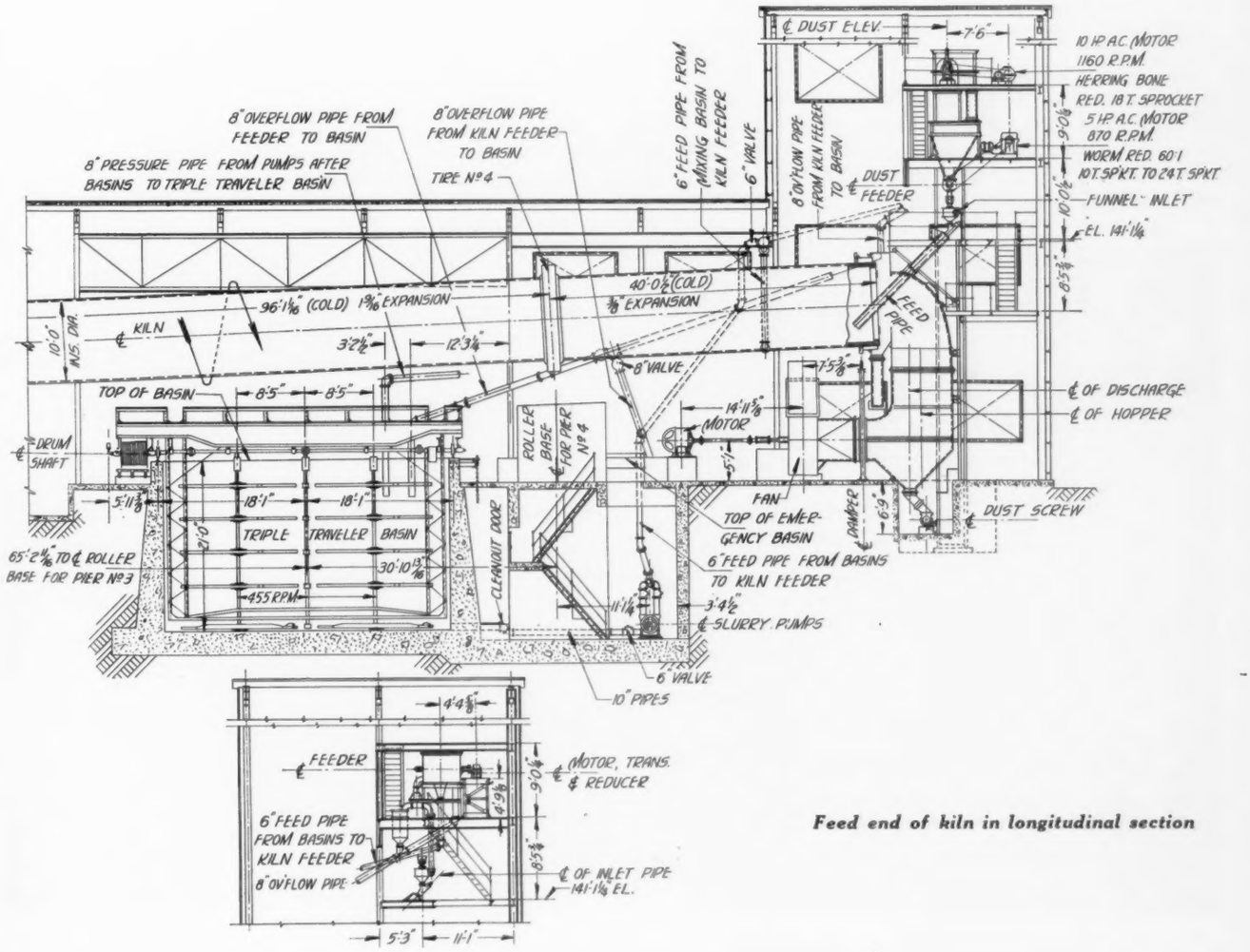
Coal is received at the plant in open gondolas on the Burlington railroad on a switch that serves the single coal silo, where this material is dumped to a track hopper that in turn feeds a 24-in. by 20-in. Jeffrey hammer crusher, driven through an enclosed gear reduction unit by a 20-hp., 1160-r.p.m. induction motor. The hammer mill discharges to the foot of a steel bucket elevator provided with 6-in. by 11-in. buckets; and the crushed coal is elevated at an angle of approximately 60 deg. to the top of the reinforced-concrete silo, holding 300 tons of crushed coal. This elevator is driven by a 10-hp., 1160-r.p.m. induction motor through a right-angled, De Laval gear reduction unit (45:1).

The coal silo feeds a 20-in inclined belt conveyor, driven by a 10-hp., 870-r.p.m. induction motor at the head pulley through a Falk (28.7:1) reduction unit. The carrier and return rolls are grease-cup lubricated. This belt is 512 ft. long and discharges to a small steel hopper that in turn through a Schaffer "Poidometer" feeds the damp coal to an F. L. Smidth and Co. "Pyrator."

The 20-in. by 4-in. by 6-in. poidometer is driven by a 3-hp., 1160-r.p.m. induction



Longitudinal section through finish grinding mill



Feed end of kiln in longitudinal section

motor. From this weighing device the coal is fed by a short screw feeder to the Pyrator proper. This screw feed is driven by a 5-hp., 1160-r.p.m. induction motor through a Falk (13.3:1) speed reduction unit. The bucket elevator and conveyor used here were supplied by the Weller Manufacturing Co.

The Pyrator consists of a "Unidan" grinding mill through which previously heated steel balls are passed, the balls being in a closed circuit. The circuit consists of a method of feeding hot balls, a method of removal, elevating the balls, heating and returning to the feed end of the machine. The steel balls are used here for two purposes, one being to act as a method of heat transfer with the ultimate aim of drying the coal and at the same time to pulverize it to a suitable fineness for burning.

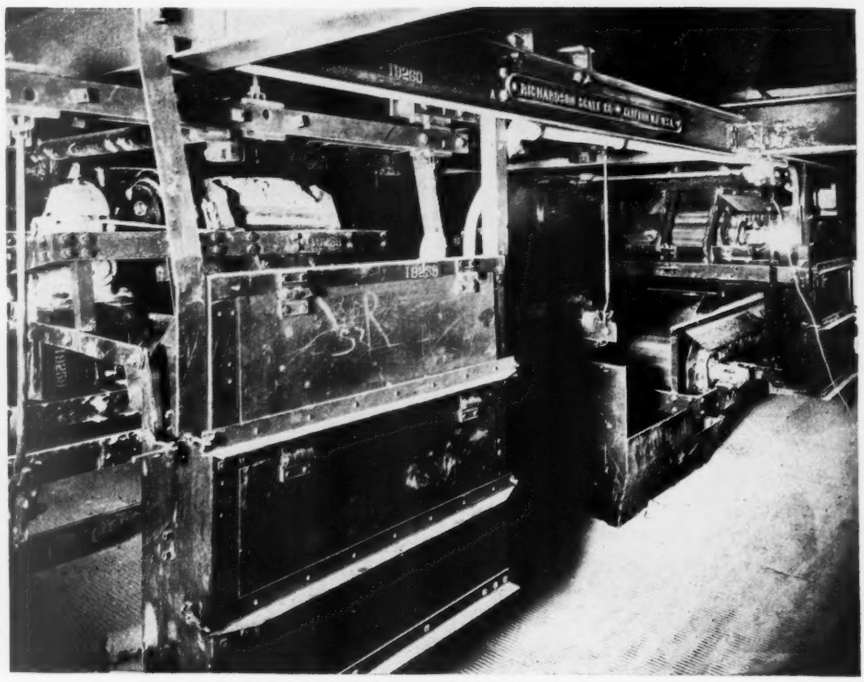
There are two fans used in connection with this system, one circulating hot air drawn through ducts that pass through the fire box that also heats the steel balls, and this hot air passes around the No. 16-35 Unidan mill which is provided with a jacket to retain this hot air. This fan's air operates in a closed circuit. This is merely a means of indirectly heating the outside of the dryer-grinding mill. The second fan draws hot air from the firebox through the chamber used for heating the steel balls and discharges to the atmosphere through a suitable short stack.

One fan is driven by a 5-hp., 1160-r.p.m. motor and the second by a 5-hp., 1750-r.p.m. induction motor. The elevator used for returning the cold steel balls to the heating chamber is driven by a 5-hp., 870-r.p.m. induction motor through a right-angled De Laval reduction unit at the head pulley. An eccentric arm that is used to deliver the heated balls to the feed end of the mill is driven by a Westinghouse motor, type SK-DC, 2-hp., 500/200-r.p.m., through a (40:1) right-angled, De Laval gear reduction unit.

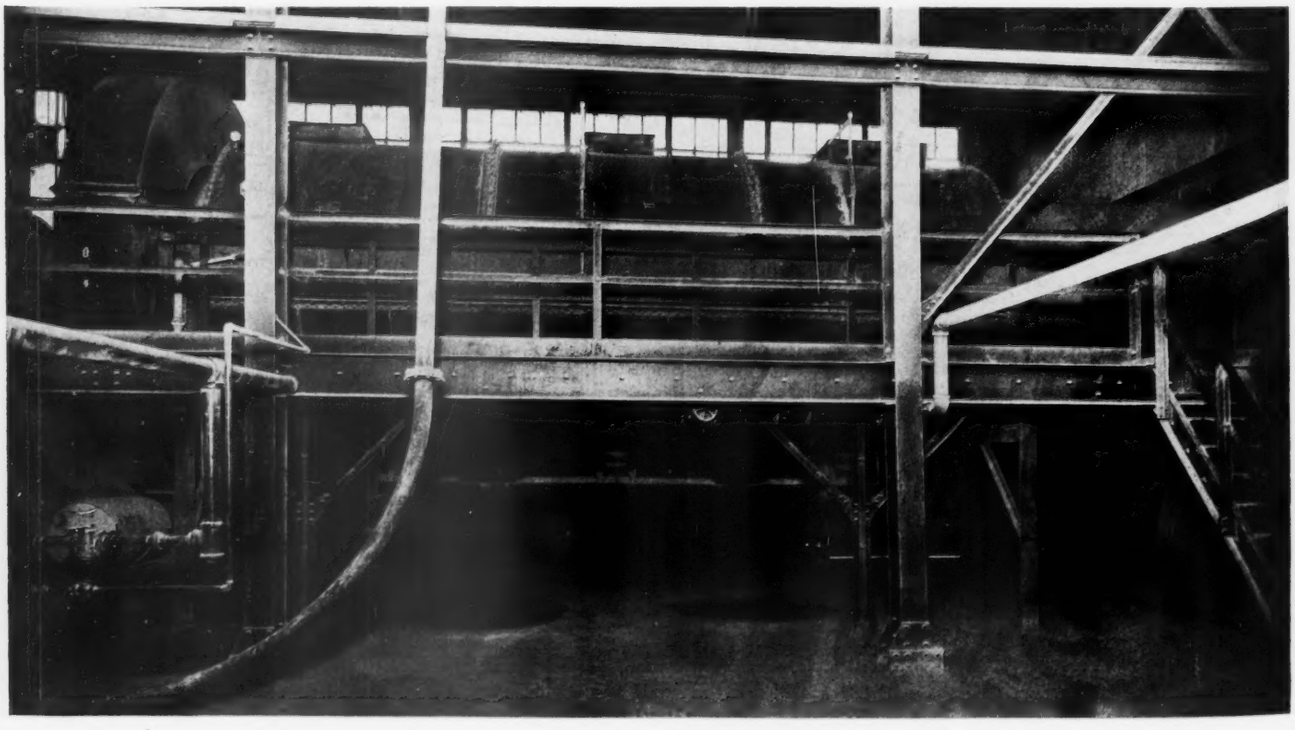
The Pyrator or Unidan mill proper is driven by a 250-hp., synchronous motor, 2200-volt, 53.5-amp., 164-r.p.m., 55 field volts, 64 field amps., direct-connected by an extended shaft to a pinion that drives the mill in conjunction with a ring gear.

The mill carries a charge of 50,000 lb. of steel balls and Cylpebs.

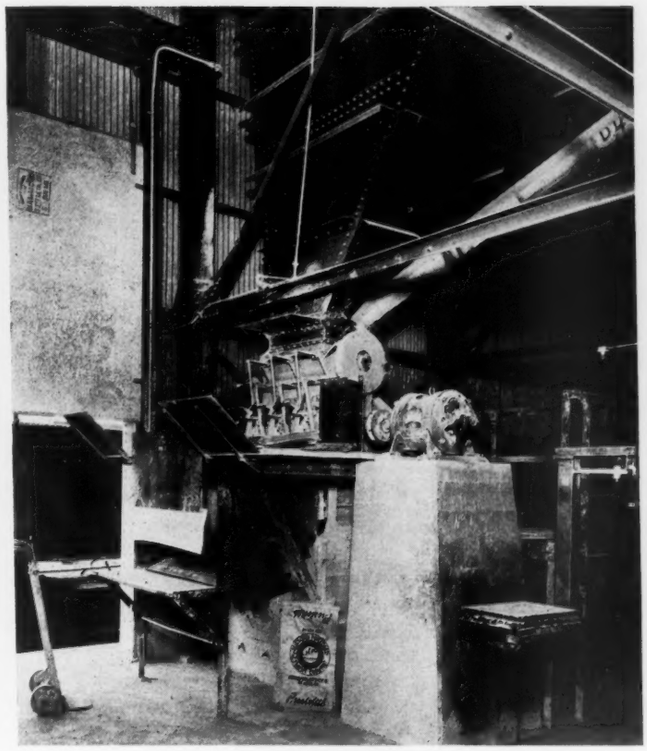
The dried coal falls to a 12-in. cross screw conveyor driven by a 5-hp., 1160-r.p.m. induction motor through a Falk (19.2:1) gear reduction unit, and this screw conveyor delivers the powdered coal to a 6-in. Fuller-Kinyon pump. This pump is



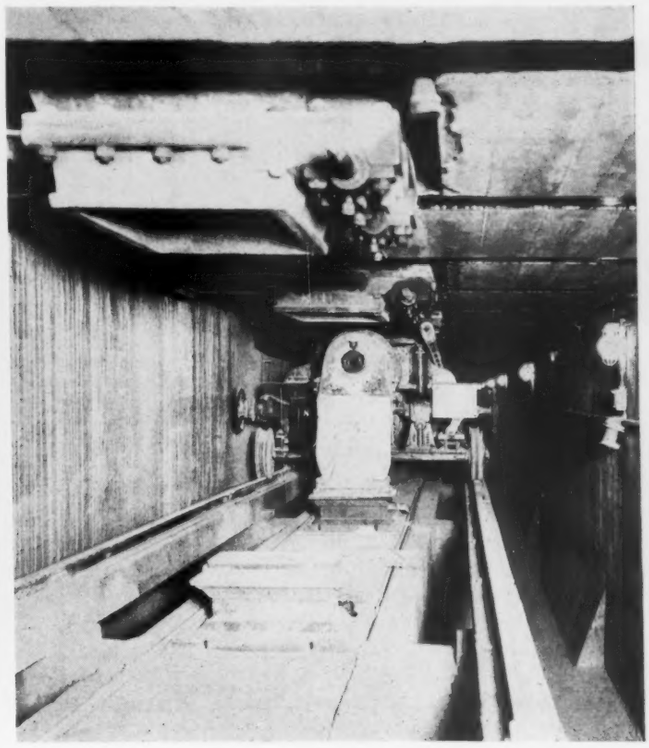
Automatic proportioning of clinker and gypsum



General view of one of the finish-grinding mills



Mounting of sacking machine



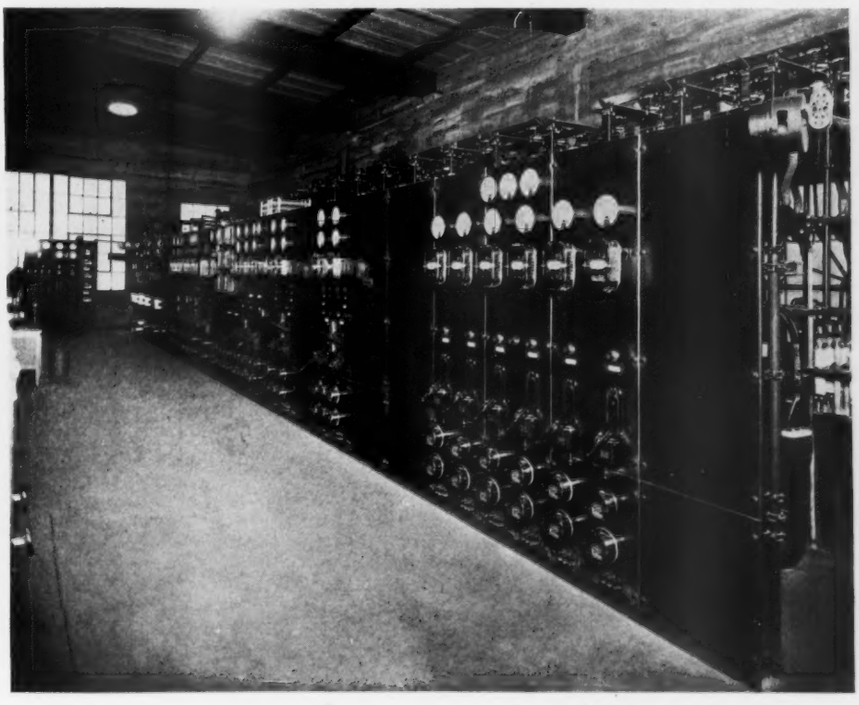
Device for withdrawing cement from silos

driven by a 10-hp., 870-r.p.m. induction motor, which delivers the coal to the steel storage hopper in the kiln room proper.

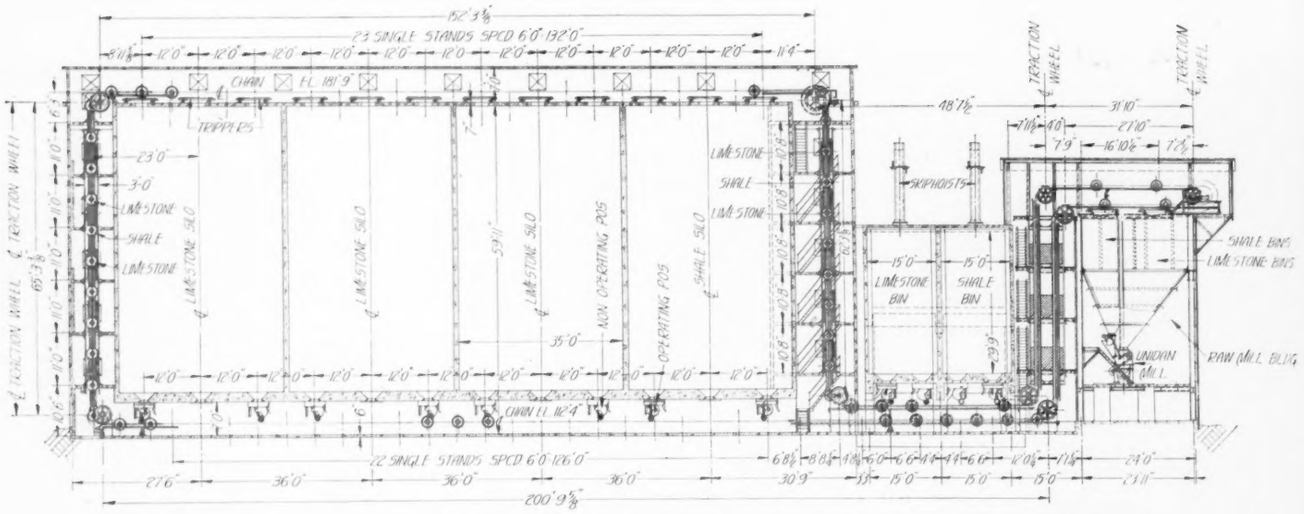
Power Features

Power is purchased from the Union Electric Light and Power Co., St. Louis, and delivered to the plant at 33,000 volts, where the current is stepped down by company-owned transformers to 2300 and 440 volts for plant use. At these voltages the power is delivered to the sub-station located in an area that is practically the center of the new plant. The sub-station is of reinforced concrete throughout and houses one of the most elaborate and interesting switchboards that can be found in any industrial plant. This board was designed by F. L. Smidth and Co. and built by the Westinghouse Electric and Manufacturing Co. This sub-station, or rather power house, so far as the cement plant is concerned, distributes the power of the three 2000-k.v.a., 33,000-volt to 2300-volt transformers of the outdoor transformer station. Just outside the power house are located three 400-k.v.a. step-down transformers for the supply of 440-volt a.-c. current.

The equipment of the power house is as follows: Main switchboard, to be described later in detail; two Pennsylvania air compressors, direct-connected to two 100-hp. Westinghouse synchronous motors; two 40-k.w., 55-v. d.-c., 2200-v. a.-c. Westinghouse M-G sets, for the excitation of all of the eight large synchronous motors throughout the plant; two 100-kw., 250-v., d.-c., 2200-v., a.-c., Chandeysson M-G sets for the supply of all d.-c. motors; one 240-hp., 8-cylinder "Dolphin" Sterling gasoline engine, arranged for direct coupling over a Falk speed reducer and a Cutler-Hammer magnetic clutch to one of the above-mentioned Chandeysson M-G sets. In case of failure of the regular power supply this engine is able to furnish both d.-c. and a.-c. power in such an emergency. Furthermore, a small M-G set is provided for the charging of a small storage battery. This battery is provided for the tripping of all circuit breakers in the power house and also the two 33,000-v. Westinghouse type G-22 oil circuit breakers, one for each of the two incoming power



Main switchboard-controls here for entire plant



Longitudinal section through the limestone and shale silos showing unusual conveyor installation

lines at the outdoor transformer station.

To get the full benefit of the two 33,000-v. incoming power lines the last-mentioned two breakers were installed. The tripping of these breakers is controlled by induction type overload relays as well as reverse power flow relays. In case of failure of one of the two power lines the reverse power relays will cause the tripping of the breaker in question and isolate the defective line, thus preventing interruption in the supply of power to the cement plant. Besides these relays, mounted on the central panel of the main switchboard in the power house, there are also found red and green signal lamps indicating the breakers open or closed, and finally, a set of push buttons permitting the instant tripping of the two breakers from the power house in case of any emergency, thus shutting the power off from the entire plant.

The main switchboard is 55 ft. long, including a number of blank panels to take care of any future extension of the plant without breaking up the systematic grouping of all the feeders to the various mill departments. Facing the switchboard, all the 55-v. and 250-v., d.-c. generator and feeder panels are found to the extreme left. To the extreme right are found the present six a.-c. 440-v. feeder panels. The central part of the main switchboard contains all of the 2200-v., a.-c. panels, grouped on either side of the above-mentioned central panel, containing the relays for the 33,000-v. breakers. To the left are found all feeders for the raw mill and crushing plant, and to the right all feeders for the clinker mill and the coal mill.

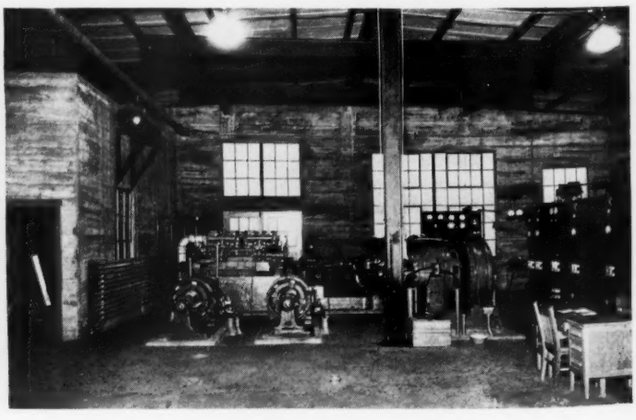
Next to the central panel is found the total metering panel of the power house, containing ground detector, voltmeter, power-factor indicator, ammeter, total watt-hour meter and one Esterline-Angus graphic wattmeter. Whereas these meters indicate the total power as measured on the 2200-v. side of the power transformers, the power is paid for as measured on the 33,000-v. side of the transformers.

In order to reduce uncertainty as to the correctness of the amount of power metered at this point, duplicate sets of 33,000-v. metering transformers are installed at the outdoor transformer station, and the secondary leads of these transformers are carried a distance of 250 ft. underground to a special metering panel, mounted at the extreme end of the main switchboard and at 90 deg. to this. Alongside is found the panel for the control battery and the general lighting panel.

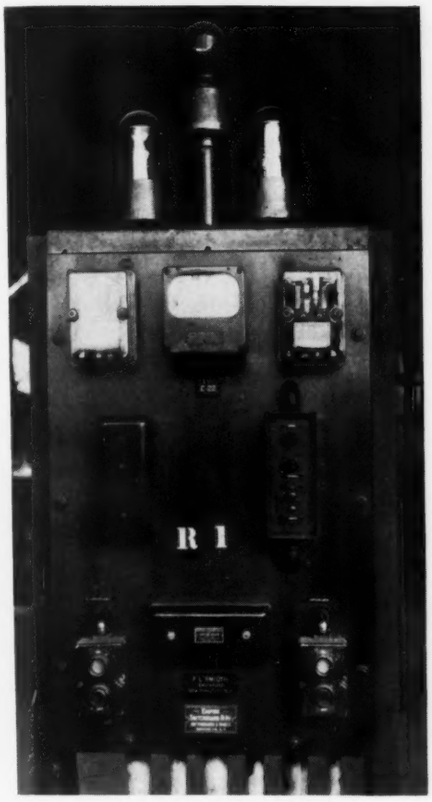
On this metering panel are mounted two Westinghouse type RA recording-demand-watt-hour-meters. These demand-watt-hour-meters are identical except for the fact that the one owned by the power company integrates over a 15-minute interval, whereas the second one, belonging to the cement company, integrates over a 5-minute interval. The last-mentioned is equipped with an adjustable auxiliary contact to be set so as to close when a predetermined maximum demand of power is reached. The closing of this contact will energize a relay which in turn will sound an alarm or otherwise cause action to be taken to reduce the power demand for the next successive 10 minutes, forming a part of the 15-minute interval making a basis for the maximum demand charge.

As the load of a cement plant is a very steady one, the same number of units in operation will result in practically the same load all year around, and if it is arranged to prevent unauthorized starting of large units it becomes a comparatively simple matter to stay within predetermined values of power demand.

Compressor installation



Auxiliary power unit



Typical motor signal panel

In order to accomplish this and also in order to simplify the control equipment for the large motors, the starting and entire control of all of the synchronous motors in the plant is done by the operator in the power house. The oil circuit breakers, which are Westinghouse B-16, thus become both feeder and motor-starting switches. The power-house operator can follow the performance of the starting of the motors in the mill by watching the meters on the main switchboard. Any irregularity in the performance of any motor is immediately detected by this operator, and experience has shown that this arrangement has several advantages over 2200-v. starting equipment located in the mill proper. A signal system is provided between the motor and the main switchboard and in an emergency a stop button permits the immediate stoppage of the motor from the signal panel at the motor also during the period of starting, which of course is of importance when it comes to the "spotting" of the mill. The signal system consists of red and green lights and Klaxon horns in the mill and the power house. The signal lights are arranged in series, so there is no question about the working of the system.

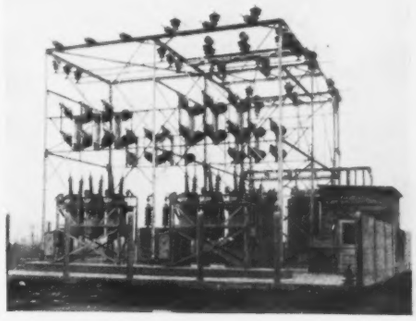
All oil switches in the power house are equipped with disconnects, but as an added precaution disconnects are also provided in the mill at each motor, thus preventing, by locking the cabinet for the disconnects, accidental starting of the motor when the mill is under repairs. On the signal panels at the motors are also found watt-meters telling the operator how far the mill is carrying its normal load. All of the synchronous motors are of the Westinghouse Symplex type, and the acceleration of the motors during the starting is entirely automatic, controlled by pilot, motor-driven, drum switches, causing the proper timing and sequence of switching the field circuit. All the operator has to do is to close the handle of the B-16 oil circuit breaker of the main switchboard.

The switch gear for the field control of the synchronous motors is located in a basement under the main switchboard. The same basement also forms a cable vault for all of the cables for the plant. Lead-covered cables, cambric-insulated, made by the Standard Underground Cable Co., are used throughout the plant, and the conduit system is fiber conduits laid in concrete.

For the overload protection of all of the large motors, induction type relays are used throughout, and will be noted at the bottom of the panels of the main switchboard. As a further protection of the motors temperature relays are also provided in parallel with the induction type relays.

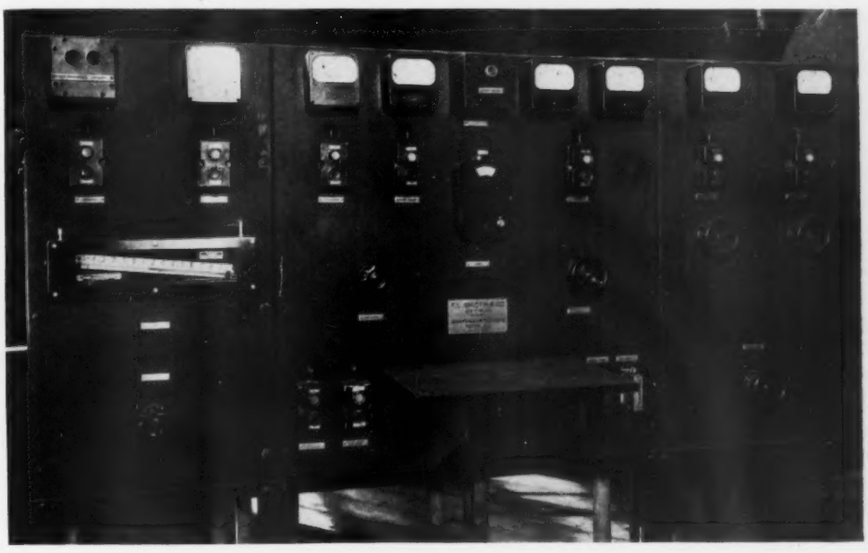
For the starting and control of the 440-v. motors throughout the plant, a special type of unit starter is used. Each starter consists of an outlet box where all the feed wires, motor leads and control leads terminate in a way forming a natural terminal point of the wiring. The box of the unit starter is then in a simple manner clamped up against this outlet box and it is an easy matter to connect the leads of the outlet box with the corresponding terminals of the unit starter. The idea is to reduce field wiring to a minimum and permit the interchange of starters with the least amount of delay in case of failure of any one unit.

Each starter consists of a terminal block, safety disconnect, fuses, test links, across-the-line contactor and thermal overload relay. There are only two sizes of contactors used for all motors from 50-hp. down. Thus the only difference between these two classes of starters is the rating of the fuses and the thermal overload relays. Each starter is also equipped with an ammeter and a push button. All starters are arranged in groups for each department or section of a department, but auxiliary control buttons are found at each motor. A glance at the ammeters of such a group of starters gives an instant idea of the working of the department in question. This idea of centralized control is carried out through the plant.



Transformer station, 33,000 volts to 2300 and 440 volts

In the instance of the control for the kiln a master control is located on the burner's platform and is fully equipped with meters and push buttons, so as to give the operator full and instant control of all the motors entering into the operation of the kiln department. On this master control panel is also found the electric pyrometer giving the temperature of gases leaving the kiln. On this panel are also found draft indicators,



Kiln control panel—probably the most complete in the industry

magnetic revolution counters, speed indicators and complete remote control for the slurry-feed system.

Because of the great length of the kiln and the corresponding distances between the various motors to be controlled from the burner's platform, this centralized master control panel became a necessity and a natural development. This panel was designed by and built under the supervision of the electrical department of F. L. Smidth and Co., as was also all of the electrical equipment of the entire plant.

Details of Electrical Distribution System

The connections on the 2300-volt side of the transformer bank are of flat copper bar and run directly into a small switch house located near the transformers. Five parallel 3-conductor cables run underground from this point to the switchboard room or power house, and tap directly to the 2300-volt bus.

The following circuits are fed from this 2300-volt bus:

(1) Raw Unidan mill—600-hp. synchronous motor.
(2) Raw tube mill—450-hp. synchronous motor.
(3) Unidan mill — 250-hp. synchronous motor.
(4) Crushing plant — two 200-hp. slip-ring motors.
(5) 100-kw. M-G set No. 1 2300-volts, a.-c.—250-volts d.-c.
(6) 100-kw. M-G set No. 2 2300-volts, a.-c.—250-volts d.-c.
(7) Future M-G set No. 3.
(8) Lighting transformers and two 40-kw., M-G, exciter sets.
(9) Primary of 1200-k.v.a. transformers bank 2300/460-volts.
(10) 100-hp. synchronous motor for air compressor No. 1.
(11) 100-hp. synchronous motor for air compressor No. 2.
(12) Future air compressor No. 3.
(13) Chamber mill — 100-hp. synchronous motor.
(14) Coal Pyrator No. 1 — 250-hp. synchronous motor.
(15) Future coal pyrator.
(16) Future coal pyrator.
(17) Clinker Unidan mill — 600-hp. synchronous motor No. 1.
(18) Clinker Unidan mill — 600-hp. synchronous motor No. 2.
(19) Clinker tube mill—450-hp. synchronous motor No. 1.
(20) Clinker tube mill—450-hp. synchronous motor No. 2.
(21) Future clinker Unidan mill.
(22) Future clinker tube mill.

The 460-volt bus is fed direct from the secondary of the 1200-k.v.a. 2300/460-volt transformer bank. The following circuit feed out from this 460-volt bus.

(1) Crushing plant, raw storage and raw mill—225-amp. connected load.
(2) Basins—350-amp, connected load.
(3) Kiln department—150-amp. connected load.
(4) Clinker mill — 200-amp. connected load.
(5) Future.
(6) Future.

The third class of switching equipment to be described is the 230-volt, d.-c., two-wire system. The two 100-kw. M-G sets mentioned above supply power to, and the following circuits are fed from, the d.-c. bus:

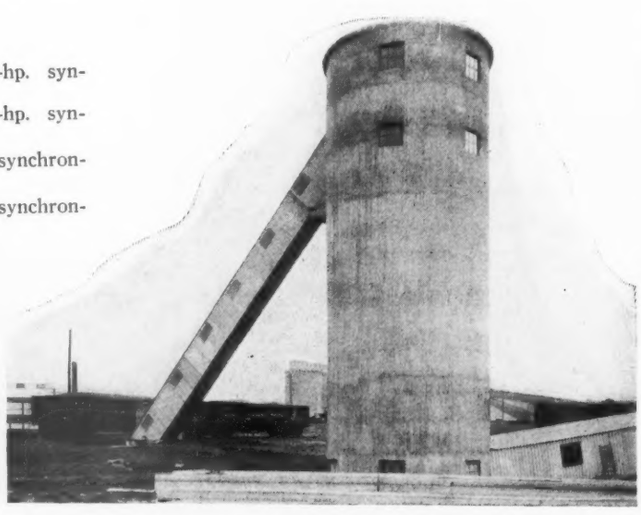
(1) Kiln coal screw and coal blower motors 500-amp. connected load.
(2) Slurry feeder and draft fan motors 480-amp. connected load.
(3) Future.
(4) Future.
(5) Future.

Compressed Air Supply

In the centrally located power house are two compressors for supplying air for agitation, Fuller-Kinyon pumps and for general plant use. Both compressors were supplied by the Pennsylvania Compressor Co., Easton, Penn. The small unit is a class 3 AE, 17-in. cylinder, 12-in. stroke, 257-r.p.m. and 50-lb. compression. This machine is driven by a type HR, synchronous Westinghouse motor, 100-hp., 2300-v., 21.1-amp., 257-r.p.m., 55 field volts, 45 field amp., 100 power factor, 3-phase, 60-cycle, and the motor is mounted on and a part of the crank shaft. The larger compressor is a two-stage unit, Class D.E.-2 air cylinder, 14-in. diameter on low side and 9-in. on high side, 10-in. stroke, 100-lb. operating pressure, 257-r.p.m. and the motor is connected to the crank shaft similarly to the single-stage compressor's motor. Both compressors discharge to vertical, cylindrical air receivers outside the building, supplemented by two additional receivers located near the point of use incidental to the operation of the Fuller-Kinyon pumps.

Laboratory

All necessary chemical and physical testing is done in the laboratories of the company, which also serve the older portland cement plant. Here can be found all of the usual compression and tensile strength testing machines, screening devices and storage cabinet for the physical tests that go to make up a modern cement testing laboratory.



Coal storage silo of the new Velo cement plant of the Missouri Portland Cement Co.

Personnel

The executive offices of the company are in the Bell Telephone Building, St. Louis, Mo. Harry L. Block is president; George M. Block, vice-president and general counsel; Hiram Norcross, vice-president and general manager; C. A. Homer, vice-president; B. G. Coyle, assitant to the president; W. D. Walsh, sales manager; John Soell, purchasing agent, and Forest Kaufman, director of sale of Prestolith Velo.

The operating personnel of the Velo plant is under the direction of the same staff who operate the older portland cement plant at Prospect Hill and consists of George Ross, manager; O. F. Schulzke, superintendent and chief chemist; V. K. Newcomer, chief engineer, and D. B. Coleman, assistant engineer.

Much credit for the design of the plant is due the late D. N. Armstrong, who as vice-president and general manager had an active part in both planning and construction of the new plant.

Characteristics of Stone Determined Experiments

THE COMPRESSIVE STRENGTHS of cast stone in the form of 2-in. cylinders, 2 in. long, have been found by the Bureau of Standards to vary within wide limits, with an average value of 6250 lb. per sq. in., the Department of Commerce stated January 4. The statement follows in full text:

On account of the increasing use of this product as a building material there is a demand for knowledge of its physical properties, more particularly the resistance to weathering, so that acceptance specifications may be intelligently written. While freezing resistance as a measure of durability is a most important property, the Bureau believes that it would be impracticable to have such a requirement in the specification.

Determinations of those other properties such as strength, absorption, etc., which can be made in a short time, and may possibly indicate freezisg resistance, have been made to discover any possible correlation between them and freezing resistance. The freezing tests have only been partially completed, but results varying from complete destruction by 25 cycles to no sign of disintegration at 500 cycles have been obtained.

American Concrete Institute Makes Literature For Producers To Study

IN a three-day convention which was crowded with evening programs as well as meetings during the day time, the members of the American Concrete Institute met at Detroit for their annual gathering. The meetings were held at the Book-Cadillac Hotel on the twelfth, thirteenth and fourteenth of February. While most of the discussion centered on the results obtained in concrete structures of every kind, these results are often so closely related to the aggregates in the concrete that the discussion becomes of vital importance to producers of crushed stone, sand and gravel and the other aggregates. In the discussion that follows, the attempt has been made to eliminate the portions of the discussion which related to outside factors and to emphasize the portions dealing with matters of interest to the rock products industry. However mention is made of practically all the papers, as some parts, at least, are of interest to aggregate producers.

The opening session of the A. C. I. meeting consisted of a program of three papers placed under the general heading of "A Condition Survey of Concrete Structures." This particular session was arranged by the Institute's Committee E-6 on Destructive Agents and Protective Treatments. President ***E. D. Boyer*** opened the convention and presided at this session.

Condition Survey of Concrete Structures

A paper written by ***H. C. Ash*** of Duluth, who was unable to be present, was presented to the Institute members. The paper, dealing with the Thomson dam and reservoir in northern Minnesota covered chiefly the methods of erecting the concrete work more than 20 years ago and the condition of the work today. The principal thing of interest about this job was that complete records were left so that 20 years later it is possible to study the different parts of the construction with a knowledge of just what type of mix and just what kinds of aggregate went into the job. A complete, though primitive, testing laboratory was set up at the job and the aggregates from the various sources were tested in various mixes. The reward of the careful study of mixes and materials at this job was the completion of a piece of work that has successfully stood nearly a quarter of a century under severe climatic conditions.

L. W. Walter, inspecting engineer for the Erie R. R., presented a paper entitled "Thirty Years' Experience with Concrete." This paper dealt almost entirely with methods of placing concrete, with only slight reference to records of the kinds of aggregates used. The author spoke of the early history of concrete work through the first period when it was thought that concrete must be very dry, and the second period when the concrete became almost liquid, and down to the present with a regulated amount of water. His contention, substantiated by lantern slides, was that the cause of failure and disintegration has been almost entirely due to segregation of the materials during the pouring of the work and to faulty water-cement ratio.

The final paper of the opening session was given by ***R. B. Young,*** testing engineer, Hydro-Electric Power Commission of Ontario, Toronto. This was entitled "Lessons from Concrete Structures in Service," and like the previous paper dealt largely with the failure of structures due to faulty mixes. Segregation, faulty water ratio, and improper placing resulting in a porous concrete are chiefly mentioned as the greatest sources of poor concrete work. It is interesting to note that in the three papers before the session, practically no accusation was made against the aggregates as being a cause for trouble. Mr. Young does mention the necessity of obtaining good aggregates, but apparently assumes that a sound aggregate is the general rule. In the discussion which followed the paper, however, the aggregates did not fare so well. Necessity for sound aggregates was stressed by a number of the members in the discussion. Kristen Friis showed some pictures of a limestone which to all appearances was perfectly good, and which showed an abrasive test of less than 3% and a crushing strength of 18,000 to 25,000 lb., yet which showed unsound under the sodium sulphate test. Pictures of structures in which this aggregate was used showed disintegration to an alarming extent, in comparison to structures built identically but with other aggregates. The answer in this case was that the limestone contained certain deposits of bedelite which rendered it unsatisfactory for concrete work. Other speakers repeated that engineers must watch their aggregates as these may be a very important cause of failure.

An interesting discussion of the use of the air hammer for vibrating forms and reinforcing during the pouring of the concrete, was also brought up by Mr. Young's paper. The suggestion is passed on to ROCK PRODUCTS readers because it may prove a good idea to many about the plant, since an air hammer is a common tool in our industry. Vibrating the forms or the reinforcing tends to get the wet concrete down into all the cracks and holes, and thus to make a denser job. It must be remembered, however, that too much vibrating is possibly detrimental, and is especially so if the concrete has had its initial set.

Concrete for Water Tunnels

The evening session continued the same theme of the condition of concrete structures that was started in the first session. The first paper was by ***L. G. Lenhardt,*** assistant engineer in charge of land tunnels for the Department of Water Supply of Detroit, and was entitled "The Concrete Lining of the Water Supply Tunnels of Detroit." The paper details the methods of construction of a water supply tunnel several miles long under a well-populated portion of the city. In this work a very smooth finish was required because of the necessity of cutting down the friction head of the water. Because of this, oversanded mixes were adopted as they provided a much smoother finished surface. The standard mix adopted for the job was a 1:2:3, and it was found that this mix only cost slightly more than the usual 1:2:4 mix, due to local conditions which made the cost of coarse aggregates relatively high in comparison with sand and cement. The fine aggregate was defined as that passing a No. 4 sieve and retained on a No. 100 sieve. An average fineness modulus of 3.00 and a uniform grading were required. The coarse aggregate had to pass a 2-in. square opening and be retained on a No. 4 sieve. The average fineness modulus was 7.25 and the grading had to be uniform.

An interesting development of the work was the finding in regard to storage of cement. In some cases it was necessary to store the cement, under very good conditions, as long as three to five months. The tests from this stored cement showed a reduction in strength of as much as 30% after five months, from the standard of fresh cement. New cement was therefore specified on the job.

From the very beginning of the work, inspectors were placed at the sand pits to inspect all of the aggregate shipped to the job. After considerable experiment it was found that the most uniform samples

could be obtained from loading belts, rather than from the cars themselves. Screen analyses were made at the pits, and when the car was determined as entirely satisfactory the inspector tagged it for shipment. Upon arrival, the yard inspector again inspected the car and its method of unloading. Where clam shells were used for unloading, it was required that they be dumped while swinging because this gave the least segregation. As this is also the fastest method of unloading little difficulty was encountered in securing the cooperation of the supply yards.

The balance of the paper deals with the actual construction of the tunnel, outlining the method of placing the steel forms, of filling the forms, of tamping, and of testing. No reinforcement was used, due to the difficulty of getting it correctly in place and getting the concrete around it, so it was necessary to make the tunnel walls of considerable thickness. That a fine grade of concrete was obtained is shown by the average strengths of cores removed from the work during the progress. The average of all invert cores was 5040 lb. per sq. in. and of all cores at the crown was 4275 lb. per sq. in. The lower strengths of the latter cores is partially explained by the difficulty of ramming the concrete at the crown, and also by the fact that lower portions of the concrete are compacted more due to a heavier mass above them.

Care was taken throughout to make the job as uniform as possible with no weak or bad spots whatever. As Mr. Lenhardt says, "It is better to obtain 100% of 90% concrete, than 90% of 100% concrete" (that is, if the other 10% is of questionable character).

A. S. Douglass, construction engineer for the Detroit Edison Co., and ***J. S. Nelles,*** also of the Detroit Edison Co., presented a paper entitled "Three and One-Half Years' Experience of the Detroit Edison Company in Concrete Control," which followed out the same general line of the previous papers. The paper outlined the work of the company in obtaining accurate control of the various factors of concrete work to the end that better concrete could be made more cheaply. Consideration is given to the type of aggregates, the mix, the amount of mixing water, the methods of placing and the manner of curing.

In discussing aggregates, Mr. Douglass placed the possible sources under four heads. First, there was the river and lake gravels, unscreened. Second, there was river sand and fine gravel mixed with crushed limestone and sold as a balanced aggregate. Third, there was the washed and screened pit sand and gravel sold separately or in combination. And lastly there was various grades of crushed limestone. The first type, river gravel, was generally not acceptable because of its non-uniform grading. The balanced type was also objectionable because it seemed impossible to get the limestone uniformly mixed, and because the limestone was likely to be coated with crusher dust. Also in most cases the sand was too fine and the stone ran too much to one size. With the various grades of limestone the same objection of too much dust was raised and it was stated that the stone was lacking as to grading.

Sees Tendency for Less Carefully Prepared Aggregates

The materials generally used were the washed and screened pit materials, and these were always bought uncombined. Due to the demand for carefully graded aggregates the pits frequently set up laboratories and did considerable constructive work in controlling the mixing of the aggregates on the loading belts. Mr. Douglass deplored the fact that since 1927 this care had largely disappeared because the greater demand for aggregates had required more speed at the pits which was inconsistent with accurate grading. He pointed out that a few of the larger consumers demanded accurately sized aggregates, but the many smaller consumers were not as discriminating and as the latter took the larger portions of the producer's material, there was less need for accuracy.

The Detroit Edison Co. engineers experienced some difficulty with segregation of materials before they were placed in the mix. At first it was thought that by careful handling in the supply yards this could be eliminated, but though the aggregates were unloaded in layers rather than by peaking the piles, the condition still existed. An examination of the methods of loading in the pits revealed that much could be done there. Invariably the material is delivered to the cars in a closed-in chute hung over the center of the car, and feed from a loading belt or directly from the storage bins. The end of this chute is about 7 or 8 ft. above the bottom of the car and in many cases it is allowed to remain stationary, producing a series of peaked-up piles in the car. Mr. Douglass says, "If the chute could be brought down lower and automatically swung from side to side so as to spread the material, while the car is moved shorter distances, and more often, we believe there would be less segregation."

Mr. Douglass also says, "The ideal supply yard of course would stock the aggregates in several different sizes in such a way as to be able to assemble on a belt any given combination of those sizes that might be required, and deliver to the customer well-mixed aggregate with a minimum segregation."

Cement Bags Not Accurate Weights

In studying consistencies of the concrete on the various jobs it was discovered that the amount of cement varied considerably from bag to bag. Naturally this led to a different consistency when given amounts of aggregates were added to different bags. Conclusion reached by the Detroit Edison Co. engineers points to the fact that the cement mills could save themselves as much as 2% if more accuracy was used in sacking.

In summing up the advantages of concrete control as worked out by the Detroit Edison Co., the paper gives the following: (1) A concrete of known minimum strength is obtained. (2) A uniform concrete is obtained. (3) There is no trouble with laitance. (4) Data shows that there is a real saving in cement without skimping, and also a saving in labor costs. (5) It creates familiarity with concrete materials and with quantities and yields. (6) It permits a more intelligent application of the best methods for obtaining high-early-strength concretes. (7) It produces a more accurate cost study per cubic yard. (8) And finally, it eliminates 95% of the worry for the engineer and superintendent.

Inspection of Concrete Construction

John M. Bischoff, commissioner of buildings and safety engineering, Detroit, presented a paper outlining the work being carried out by the city of Detroit in securing good concrete in building construction. At present Detroit is one of the leading cities in this matter, having an excellent inspection and testing service which insures a good quality of concrete in buildings. The work of inspection starts with the aggregates and is carried right through to the finished work, sample cylinders being taken as the work progresses. These cylinders are broken at seven and 28 days and the result noted on the record opposite the job. All records are carefully kept as to mix, aggregates, curing, weather condition and allied data.

Francis S. Onderdonk, of the College of Architecture of the University of Michigan, presented a very interesting paper entitled, "Is a Specific Ferro-Concrete Style Evolving?" The title of the paper is somewhat misleading as the subject matter refers to the new type of architecture growing out of the greater use of reinforced concrete. Architects would find this paper of particular interest, and in our own field, the manufacturers of concrete products would find much material of interest to themselves. Mr. Onderdonk's theme was that concrete was liquid stone, and as such could be made to fit the natural curves of nature instead of the straight "wood-center" style which was evolved in the early days of concrete. He pointed out that precast concrete work could be made available in any form from delicate window traceries up to the largest pieces and columns. His paper was il-

lustrated and dealt with both concrete work cast in place, and precast concrete work. In the former he called attention to the possibilities of getting away from the straight lines so common before and getting to the more beautiful curves. He mentioned particularly the parabola as the curve successfully used in building construction in Europe to give a feeling of unity to the whole building.

In the precast discussion, he mentioned a number of American and European architects who have availed themselves of this unit. Frank Lloyd Wright, the famous American, had evolved a distinct type of concrete block, he said, which was different from the rock face, and yet did not have the plainness of the smooth faced block. Concrete window traceries and doorways can be designed, and many other uses of concrete can be found. A concrete sculpture is being evolved in which the concrete is poured in forms roughly approximating the finished figure, and then the figure is cut out by the artist as soon as it is possible to remove the form, and before the concrete has assumed its final hardness. Such work was successfully done on a church in France, and through its use, a Gothic edifice was completed in a very short time and in an economical manner.

Volume Changes in Concrete

Two sessions were in progress at the same time on the afternoon of February 13. The session under ***Duff A. Abrams*** covering designing and tests of concrete was attended by the larger portion of the members, while the session dealing with the problems of precast stone, stucco and other cement products was well attended by the members of the National Concrete Products Association, who stayed over from their Monday convention.

Raymond E. Davis and ***G. E. Troxell,*** of the University of California, presented a paper entitled "Volumetric Changes in Portland Cement Mortars and Concretes," which detailed a long series of tests made at the materials testing laboratory of this university. They stated that numerous noted volume changes in concrete had prompted the investigation which took the form of determining the difference in lengths of specimens under varying moisture conditions. The test program includes the determination of the effect of richness of mix, gradation of aggregate, quantity of mixing water, character of aggregate, moisture conditions and conditions of curing. Studies also are to include determination of the effect of alternating periods of watersoaking and drying, the effect of admixtures and the effect of a surrounding medium. The general procedure throughout the tests was to maintain the temperature at a constant value, and to subject the specimens to such combinations of moisture conditions as were required by the program.

The mortar tests were divided into three groups: first, those utilizing materials other than cement and sand to produce the plasticity required; second, those in which were incorporated integral waterproofing compounds; and third, plain cement mortars with variations as to richness of mix and water-cement ratio.

The concrete tests were made with two types of aggregate. The first was entirely of crushed granite (including the sand), while the second was of Coast Range gravel containing a wider range of metamorphic and igneous rocks.

In the mortar bar tests where the bars were made up of 1 part of portland cement to 3 parts of fine river sand, with high calcium hydrated lime added, the following results were obtained: the bars in air decreased in length rapidly at first, the shrinkage amounting to 0.14 to 0.16% at one year with further shrinkage apparently insignificant. Apparently the amount of lime added had little effect on the shrinkage. Mortar bars stored in air seven months and thereafter in water do not return to their original length but show a net shrinkage of one-third to one-half of the shrinkage attained prior to immersion, with 70% of the recovery in the first 20 hours of immersion, and volumetric equilibrium reached about three months after immersion.

Brick piers in air expand during the first two or three months, with the plain mortar pier showing the largest expansion in air and the pier laid in mortar with the greatest lime content showing the least. After reaching their maximum expansion in air, the brick piers shrink continuously until they regain their original length at 12 to 14 months. Brick piers stored in air for 28 months and then kept wet continuously show a marked increase in length, and the change is irrespective of the lime content.

The volumetric changes of a mortar bar cast in a non-absorbent mold and stored in air is no criterion to the volumetric changes that may be expected to occur in the same kind of mortar when used as the joint in brick work.

In the 1927 series of tests, all mortar bars with molds removed shrunk quite rapidly for the first month, while the bars left in absorbent molds expanded slightly for two weeks, and then shrunk. Other tests indicated that bars of plastic cement shrunk more than any of the others, and that bars with 10% clay shrunk more than bars with 5% clay, and also bars with 10% clay shrunk more than bars with 10% of lime.

The 1928 series used brick piers. The results showed the pier with cement-lime putty mortar reached its maximum expansion after two months, and the pier using hydrated lime mortar was still expanding at the end of 170 days, but the rate of expansion was small. The pier laid in cement-hydrated lime mortar was still expanding at a fairly rapid rate after 170 days, and the expansion was greater than that shown by the hydrated lime pier.

The effect of the water-cement ratio on volumetric changes was studied on bars of two mixes and three consistencies. Of 1:2 mortars, kept wet, that having the smallest water-cement ratio had the largest expansion. Of 1:2 mortars, stored in dry air, the larger the ratio the larger the contraction. For 1:6:2 mortars there is no apparent effect of consistency of mix upon either the expansion when stored in water or upon the shrinkage when stored in air.

In testing bars with waterproofing admixtures it was determined that all bars containing admixtures exhibited greater volumetric changes.

Tests made with specimens containing crushed granite indicated that storage in water increases both length and weight. Specimens stored in air after having been water-soaked both shrink and lose weight. Under conditions of alternate air and water storage there is no evidence that the expansion accompanying immersion is materially different from the contraction accompanying the preceding period of air storage when the period of air storage is 10 days or less, but for periods of air storage of greater length it appears that the total expansion is less than the total contraction. The percentage of fines seems to have no appreciable effect upon the shrinkage, when the concrete is dried, nor upon the expansion when the concrete is water-soaked. The changes in length are accompanied by closely corresponding changes in weight. Specimens having higher cement ratios in general show the larger shrinkage when over-dried and the smaller net expansions when water-soaked.

With the crushed gravel aggregate, the specimens of a given gradation and mix, over-dried, and then stored in a constant humidity atmosphere show an expansion at first and also absorb moisture, but the rate of expansion and absorption decreases until a volumetric and weight equilibrium is reached. A number of tests of these aggregates were made, including numerous tests of oven-dried specimens. The authors reached the conclusion that the character of the aggregate had an important influence upon the volumetric changes. The crushed granite concrete with all fines included has a surface modulus of about 20, with 26% of fine aggregate passing a No. 100 sieve; series 3 of the gravel concrete tests had a surface modulus of 7, with 1% of fine aggregate passing the No. 100 sieve. In spite of this wide discrepancy in fines, the gravel concrete developed about double the shrinkage exhibited by the crushed granite concrete.

Determining Moisture in Sands

William R. Johnson, of the Research Laboratory of the Portland Cement Association, presented a paper entitled "Comparison of Methods of Determining Moisture in Sands." This paper described a series of determinations of the moisture in sands, using six different methods, as follows: electric resistance moisture meter, drying to

constant weight in oven, drying to constant weight with denatured alcohol, displacement method using cylindrical container, displacement method using A.S.T.M. flask and specific gravity method using salt solution hydrometer.

The method of procedure for each is familiar, and was carried out with the best possible accuracy. The conclusion reached was that the most satisfactory method was the one in which there were the least manipulations and hence the least chance for error. The author states that the two drying methods give the best results, since the only manipulations consist of weighing before and after drying. The two displacement methods ranked next in point of accuracy, with the manipulation consisting of weighing the samples and also in determining the displacement of water. The hydrometer method, which ranked last in accuracy, required weighing the sample, measuring a definite quality of salt solution and reading the hydrometer accurately. It is recommended that in developing further methods of determination of moisture in aggregates, attention should be given to the elimination of manipulations and that the methods be made as simple as possible to avoid pyramiding the errors.

Designing Concrete Mixtures

R. E. Robb, professor of civil engineering at Evansville College, Evansville, Ind., presented a paper entitled "A Scientific Trial Method for Designing Concrete Mixtures." In the paper the writer outlined the need of a simplified method of arriving at good mixtures for concrete. He described his experiments and the apparatus finally adopted. He says, "The basis and fundamental fact with which we have to deal in connection with concrete design is freely admitted to be the water-cement ratio." He explains the development of his device for determining the percentage of moisture in aggregate and how it can be adapted to work in the field by men who are not technically trained. His actual steps in making a scientific trial design are as follows: (1) From Abrams curve for water-cement ratios, the required ratio is determined. (2) The percentage of moisture in both fine and coarse aggregate is determined. (3) The actual amount of water in a unit quantity of each aggregate is determined. (4) A trial batch is made, compensating for moisture in aggregates, to obtain desired water-cement ratio. (5) Proportions are changed until apparent ideal mix is secured. (6) Yield is noted in graduated receiving hopper. (7) Mixed aggregate is analyzed for fineness modulus, and any necessary changes are made. (8) The water-cement ratio is checked by drying sample. (9) Yield of each batch is checked by noting volume in graduated receiving hopper.

A very worthwhile paper was given by ***Herbert J. Gilkey,*** of the University of Colorado, on "Water Tables and Curves for Use in Designing and Estimating Concrete Mixtures." It would be hard to give a worthwhile abstract of the paper, however, since its major portion is taken up with tables and curves, and the balance is chiefly explanations of the methods of use.

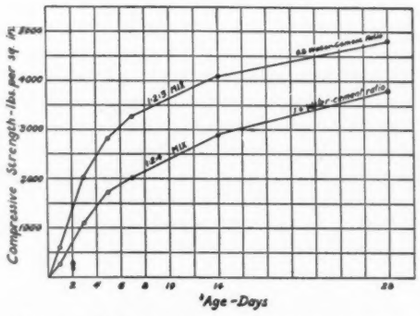


Fig. 1. Relation between age and compressive strength for two common mixes and water cement ratios

The paper covers five leading current units found in designing concrete mixtures. These are: (1) Water-cement ratio by loose or bulk volume, (2) Gallons of water per bag of cement, (3) Pounds of water per bag of cement, (4) Water-cement ratio by absolute volume, (5) Ratio of water to cement by weight. The object of the paper is to supply convenient tables and figures covering each of these and also to furnish conversion tables. The tables are fully explained and there are four diagrams covering the same general features as the tables.

High Early Strength Concrete

Edward E. Bauer, of the University of Illinois, in his paper on "High Early Strength Concrete," says: "It is the purpose of the writer to discuss briefly the factors which effect the rate of hardening of concrete and to present certain data bearing on this subject which he has secured during the past year. The rate at which concrete gains strength depends upon the following factors: (1) Kind of cement, (2) Water-cement ratio, (3) Temperature, (4) Admixtures, (5) Curing, (6) Time of mixing. These factors are so interrelated that there must necessarily be some overlapping and repetition in the discussions of each."

Mr. Bauer divides his discussion into a part on standard portland cement and a portion dealing with other cements which develop high early strengths. In his discussion on standard portland cement, he points out that other things being equal, the rate at which the concrete gains strength is a function of the water-cement ratio. Concretes with a lower ratio develop strength more rapidly. When usable early strengths are desired, those strengths may be secured with the standard brands by using proportions of dry materials which will permit the use of the desired water-cement ratio.

Fineness in grinding and uniformity in the manufacture of cement have resulted in producing higher early strengths. In making the concrete with clean and structurally sound aggregates, and when the principles of good concrete practice are followed, it is reasonable to expect good early strengths with standard cement, except when the temperature of the concrete goes below 50 deg. F. In the summer time much higher strengths are obtained.

The writer says: "The curves indicate the rate at which concrete gains strength for 70 deg. F. curing. When the temperatures are higher the strength increases at a more rapid rate, as will be shown later on. In Fig. 1 are shown the results of some tests by the writer to give the relationship between age and strength for two of the more common mixes and water-cement ratios. For each proportion four different cements were used. The concrete was machine mixed, molded, cured and tested in the standard manner. The aggregates used were fairly coarse, which accounts for the small water-cement ratio with the 1:2:3 mix and for the large amount of slump secured for the 1:2:4 mix and the water-cement ratio of 1."

Mr. Bauer continues: "During the past few years a number of American manufacturers have been producing special cements to develop higher earlier strengths than were possible with the standard brands. Not much is known concerning the exact method of manufacturing, except for one of them. In making this particular brand, the raw materials used in manufacturing standard portland cement are prepared and burned in the usual way. After the first grinding of the clinker it is put through the kiln again, after which it is ground in the usual manner. This gives the clinker an extra grinding and burning. The manufacturer guarantees that at least 90% will pass through a 200-mesh sieve.

"It should be remembered that these special cements are comparatively new and that experience with them is limited. At the present time the manufacturers are about as familiar with their product as any one, so that it seems logical to follow rather closely their recommendations. The same rules of good practice should be followed in using these cements as would be observed with the standard cements. The writer's experience with these cements is that they

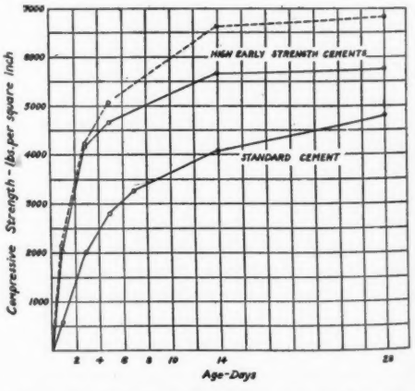


Fig. 2. Relation between age and compressive strength for concrete made with standard and special cements

do develop much higher early strengths than do the standard brands for the same water-cement ratios and conditions of making, placing and curing. The time-strength curves for these cements are different, which makes it impossible to secure average curves for this type of cement."

Mr. Bauer adds that these special cements average about $1 to $1.50 more per barrel than regular cements, and remarks that the same amount of money spent in additional standard cement would produce

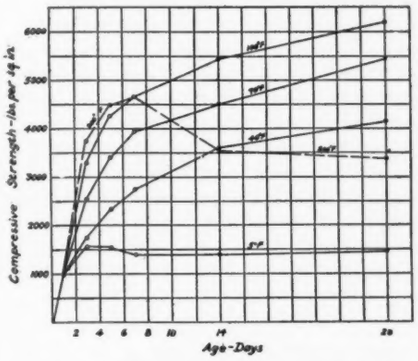


Fig. 3. Relation between age and compressive strength for concrete cured at various temperatures

the same results, for pavement work, at least.

As before noted, concretes with lower water-cement ratios develop higher strengths. This holds true at all ages, so if high early strength is needed it can be thus obtained. The paper states: "The special cements come under this rule as well as the standard brands. With the special cements the water-cement ratios need not be as small as with the standard brands to secure the same strength at the same ages. On much of the work today the old practice still prevails of specifying the proportions of dry materials with no mention of the amount of water to be used. The wetter concretes do not gain strength as rapidly as the drier ones, nor do they gain as much. It should be noted that in every instance the concretes with the lower slump values (drier concrete) develop higher strengths at all ages than do the ones with the high slump values.

"In order to use the smaller water-cement ratios necessary for high early strength the amount of aggregates that can be used with each bag of cement must be reduced. The amount of the reduction will depend upon the water-cement ratio and the gradation and maximum size of the aggregate. The best proportions to use for any water-cement ratio and given materials may be most easily determined with a few trial batches."

In discussing the effect of temperature on strength, Mr. Bauer says: "The rate at which a given concrete gains strength is a function of the temperature of the concrete and its age. At temperatures above freezing and below approximately 150 deg. F. higher strengths are developed for the higher temperatures. Concrete which is frozen does not gain any strength. Apparently there is a temperature between 100 and 200 deg. F. for which a maximum effect is secured. Sufficient test data are not available yet for us to know just where this critical point comes and what factors affect it. Strengths are developed at a more rapid rate for any temperature at the early ages than at the later ones. In Fig. 3 are given the results of a series of tests to determine the effect of the temperature of the concrete on the strengths developed. All of the concrete was machine mixed in the laboratory at 70 deg. F. The cylinders remained in the forms for 24 hr., at the end of which time they were placed in their respective curing temperatures."

The two striking results from the above tests are that the concrete specimen at 5 deg. F. gained no strength while at that temperature, and secondly that the specimen cured at 200 deg. F. gained strength up to seven days and then lost strength considerably.

The paper discusses calcium chloride admixtures as follows: "Calcium chloride is being used now to some extent as an integral curing agent and also for the purpose of lowering the freezing point of the mixing water in cold weather. Recent tests by the Bureau of Public Roads indicate that at 28 days the strength of the concrete cured with calcium chloride in the mixing water is as great as when cured with water in the usual way. If the same effect can be secured by using calcium chloride in the mixing water as by water curing, a curing problem in connection with early strength concrete will have been solved. A certain amount of strength is added by moist curing during the first few days. How can concrete be cured by any one of the usual methods after it is put into service? Strengths are often sufficient at the end of one or two days to permit partial or even full use of the concrete.

"Different cements react differently with calcium chloride so that it is not possible to say that any certain amount of calcium chloride will produce the maximum effect for all brands. Two per cent (generally taken as 2 lb. per sack of cement) is recommended as a safe amount to use. Greater amounts should only be used when tests indicate that a greater effect can be secured. It should not be concluded that because higher strengths can be secured using calcium chloride with one special cement that the same effect can be obtained with all special cements."

Mr. Bauer says: "Unless the rate of evaporation of the mixing water out of the concrete during the first week is unusually high, moist curing has effect on the early strength of the concrete. The effect of the omission of moist curing becomes noticeable as a rule at about 28 days and becomes greater as the age of the concrete increases.

"Curing should not be omitted even though the strength tests indicate good quality concrete at the early ages. In the case of the pavements, the surface layer dries out first and also receives all of the effect of traffic. Test cylinders or beams are not a measure of the quality of that surface layer unless that surface layer is kept wet, the same as the portion underneath."

In conclusion, the paper calls attention to the generally accepted idea that increasing the time of mix will increase the early strength more than the later strength. Just how much reliance in this connection can be placed on present day mixers is rather uncertain—too uncertain to be counted upon.

Tests of Retempered Concrete

H. F. Gonnerman and ***P. M. Woodworth*** of the research laboratory of the Portland Cement Association gave a joint paper on "Tests of Retempered Concrete" which was of particular interest due to the activity found at the present time in the ready-mixed concrete business. The report gives the results of studies carried out for the purpose of determining the effect on workability and strength of the resulting concrete of retempering with and without the addition of water, and secondly of premixing the cement and water for extended periods prior to mixing with the aggregate.

Tests were made with the usual care, and the methods used were not dissimilar to standard methods of testing. In the strength and flow of concrete remixed after various periods, the tests indicate that so long as the concrete remained plastic and workable the strength at any age was not materially reduced by remixing and placing without the addition of water at periods of six hours. When, however, the concrete became unworkable so that it was difficult to place in

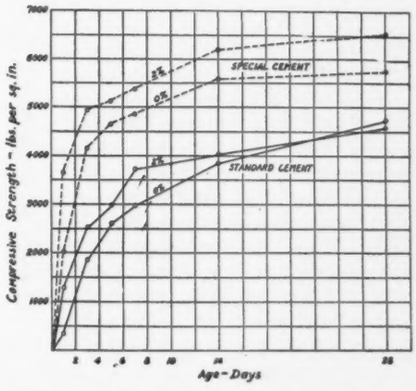


Fig. 4. Relation between age and compressive strength for concretes made with special and standard cements, with and without calcium chloride as an admixture

the molds without honey-combing, there was a quick reduction in strength. The paper continues, "When water was added to restore the concrete to its original flow there was a reduction in strength in all cases at all ages. This reduction became more pronounced as the amount of water required to restore the concrete to its original flow increased."

In the water-cement ratio strength rela-

tions for retempered concrete, the results indicate that 6 hr. is about the maximum standing time for satisfactory results. The results indicate that for plastic and workable mixes and moist curing, the final net water-cement ratio is still a governing factor in the strength of concrete, even when additional water is added to restore the workability. The workability of concrete remixed without the addition of water shows that there is a progressive reduction in the flow as the standing period increased which was more rapid for the drier consistencies. This decrease in flow was probably due to the absorption of water by the dry aggregates and the accompanying stiffening of the mass.

When a quantity of water is required to restore the workability the results are interesting. As the standing time increased the amount of water required to restore the mix to its original flow increased.

Some engineers have advocated the introduction of another time factor in mixing concrete—that of premixing the cement and water for extended periods prior to mixing with the aggregates. Tests show the workability of the concrete from the premixed paste was substantially the same as that made by the usual method of mixing except in the case of 1:7 mix where the former showed a somewhat greater flow than the ordinary concrete at periods of 2 to 5 hours. The writers conclude that premixing the cement and water prior to mixing with the aggregates has no beneficial effect on the strength of concerte. It appears such proceedure offered no advantages over the usual methods of mixing so far as increased workability was concerned and caused a material reduction in strength when the cement water paste was not used within a short time after mixing.

In comparing the use of wet and dry aggregates the writers say, "In general the workability of the concrete was greater with the wet aggregates, especially in the leaner mixtures, while the strengths obtained with wet aggregates were about the same or slightly higher than those obtained with the dry aggregates. The greater workability with the wet aggregates may be explained by the lubricating effect of the water on the surfaces of the aggregate particles, and the absence of suction between the aggregate particles and the cement paste. The greater strength was probably due to the reduction in the net water-cement ratio resulting from the greater absorption of the aggregates prior to mixing due to the long period of soaking."

Also the authors say, "Concrete exposed to air of laboratory and remixed without the addition of water generally showed an increase in strength as the time of standing increased and the strengths were generally higher than when the concrete was stored in air-tight cans. When the concrete was restored to its original workability by addition of water the strengths gradually fell off as the standing period increased and were about the same as those obtained from concrete stored in air-tight cans."

Finally the effect of admixtures in concrete remixed with and without the addition of water is shown in the following: "The use of the admixtures in concrete remixed without the addition of water increased the compressive strength slightly at all ages so long as the concrete remained plastic and workable. The flow, however, was considerably reduced by the addition of these admixtures. With 25% of admixture by volume the flow at 4 hr. was reduced to about that of concrete without admixture at 6 hr. After the 4-hr. period the compressive strength of the concrete containing 25% of admixture fell off rapidly.

"When the concrete containing admixtures was remixed with additional water to restore its original flow there was a falling off in strength as the time of standing increased, but the strengths were slightly higher than those of the concrete without admixture.

"When concretes of the same mix and flow are compared, the concrete containing admixtures of hydrated lime or celite gave lower compressive strength than that without admixture. The net water-cement ratios of the concretes containing admixtures, computed without attempting to evaluate the amount of water absorbed by the admixtures, were considerably greater after adding water to restore the original workability than those of the concrete without admixture."

The writers of the report reach the following conclusions:

"(1) The most striking result brought out by this investigation was the small loss in compressive strength due to standing for periods up to 6 hr. (protected from evaporation) in concrete remixed without the addition of water. *When the mixtures remained plastic and workable* the loss was practically nil. After the concrete ceased to be plastic the strength fell off rapidly. There was always a reduction in flow with an increase in standing period.

"(2) In concrete remixed with the addition of water to restore original flow after standing for periods up to 6 hr. (protected from evaporation) the strength was reduced in acordance with the increase in the water-cement ratio resulting from the added water.

"(3) When standing unprotected so that water was lost through evaporation an increase in strength resulted due to the lowered water-cement ratio.

"(4) Wetting the aggregates 16 hr. in advance of mixing the concrete gave about the same strength of concrete as was obtained with dry aggregates using the same total quantity of mixing water. The workability at all standing periods was materially increased by the use of the wetted aggregate.

"(5) Premixing the cement and water for 1 minute and allowing the paste to stand for periods up to 6 hr. before adding the aggregates resulted in a gradual reduction in the compressive strength as the standing period increased, which reduction at the 6-hr. period amounted to about 20 per cent of the strength at the 0-hr. period. Premixing had little, if any, effect on workability.

"(6) Increasing the time of mixing from ½ to 10 min. resulted in an increase in compressive strength both for concrete mixed in the usual manner and for concrete made by premixing the cement and water before adding the aggregate. The percentage increase ranged from 10 to 25 per cent of the strength of concrete mixed ½ min.

"(7) Tests of a 1:4½ concrete mixture containing 15 and 25 per cent of hydrated lime or celite by volume of cement, when remixed with and without the addition of water after standing for various periods, showed results similar to those obtained with concrete of the same mix without admixture. The concrete containing admixtures showed slightly higher compressive strengths than the plain but less flow after each standing period and required the addition of more water to restore the original flow. However, the plain concrete showed higher strength than that containing admixtures when comparisons were made on the basis of equal flow and mix."

Concrete Study on the Job

A study of concrete testing and determination right on the job was outlined in the paper by T. C. Powers, of the Bureau of Water Works of Portland, Oregon. The problem dealt with estimating the strength of concrete containing aggregate too large for the test specimens. Besides the water-cement ratio, two more variables are introduced—the paste content (that is the cement plus water), and the physical condition of the paste at the time of hardening. In the work which followed it was shown that the latter variable influences permeability as well as strength. Also the modulus of elasticity appears to be greatly influenced by the paste content.

The paper is entitled "Concrete Studies at the Bull Run Dam, City of Portland," and details work carried on at this unit of the water system of Portland. In all, some 200,00 cu. yd. of concrete was placed, and the aggregate for this taken from the river bars and screened to give a uniform grading from 9½-in. down. With a testing machine of only 100,000-lb. capacity it was impossible to test specimens of the concrete having the largest size aggregate, so it was decided to screen down to finer sizes and test these to determine a relation, if possible, between the tests for the smaller sizes and the strengths of the concrete containing the large aggregate.

Tests gave to the authors the following conclusions: (a) For given materials and conditions there is a definite relation between water-cement ratio and permeability, and (b) The presence of a fine inert material, such as diatomaceous earth, has a marked effect on permeability. With a given admixture, the effectiveness of the admixture depended on the cement content. In lean mixes with high water ratios the bene-

ficial effect was greatest, it was noted.

The paper further states: "It seems, then, that more than the usual amount of fine material in the mix brings about a different relation between water ratio and strength, and between water ratio and permeability. Also, that this fine material in some way causes the aggregate to be more uniformly bonded. That is, we note that fine material decreases permeability without reducing voids, increases the strength without decreasing the water-cement ratio or increasing the paste content; and that when it is present the bottom surfaces of the aggregate particles tend to become bonded as firmly as the top surfaces.

"Considering these facts we came to the conclusion that diatomaceous earth, or, we believe, any inert fine material, is beneficial to concrete in proportion to the degree to which it maintains the homogeneity of the cement paste, preventing the precipitation of part of the cement to the surfaces of the aggregate. When this precipitation or settling of the cement takes place, concentrating on the top surfaces of the stone and settling away from the lower surfaces, the concrete develops but a part of its possible strength."

In speaking of the water-cement ratio "law," as he calls it, the author says, "The existence of a strength water-ratio relationship is contingent upon the existence of a uniform relationship between water-ratio, paste content and physical condition of the paste (homogeneity) which, for sake of brevity is spoken of as the degree of plasticity. This last named relationship determines the position of the water-ratio strength curve."

Specifications for Aggregates

L. E. Williams, engineer and director, State Concrete Materials Co., Detroit, presented a paper on the "Confusion of Specifications for Aggregates" which should be of particular interest to readers of Rock Products. Mr. Williams says, in part: "It is not the intent of this paper to offer any solution of the problem in the form of tentative standardization of specifications, but rather to show the diversity of aggregates called for in the territory adjacent to Detroit and the resultant effect on materials produced in an attempt to meet the varied requirements.

"From the standpoint of specifications there are four major difficulties encountered by aggregate producers. They are (1) the multiplicity of sizes specified, (2) the fact that both sieves (square openings) and screens (round openings) are used in specifications, (3) the great diversity of specifications for aggregate used in the same type of construction, and (4) the indefiniteness of certain clauses used.

"In general there are no definite specifications for the miscellaneous sands mentioned, nor for the majority of concrete products aggregates. The following terms are used, referring supposedly to the mechanical grading of the sands: 'flat,' 'sharp,' 'fifty-fifty,' 'granite' and 'torpedo.' There is also the following nomenclature based on the use: 'masons,' 'brick,' 'plaster,' 'concrete' and 'floor finish.' All of these terms are, to say the least, indefinite. Flat sand refers to the finer grades and sharp sand means the coarses grades, while fifty-fifty sand is supposedly a combination of these two. The terms 'flat' and 'sharp' have practically no reference to the smoothness nor the angularity of the grains but apply only to the coarseness of the material.

"About the only safe way to handle the requirements of the average customer for sands not covered by a definite specification is to have him select a sample that will fill his needs, then proceed to analyze the sample and ship accordingly. Even then visual inspection by the customer may result in arguments.

"Coarse aggregates may be broadly classified by their use, as paving, tunnels, and structural. The coarse aggregates have their nomenclature somewhat similar to the fine aggregates. Such terms as 'roofing gravel,' 'pea gravel,' 'bird's-eye,' 'road gravel,' 'road surfacing material,' 'fireproofing aggregate,' 'paving aggregate,' 'bridge aggregate,' etc., are frequently used in ordering a supposedly more or less definite type of material. Often investigation will disclose a definite specification concealed in the background but in many cases the specification is no more definite than is the nomenclature discussed with reference to fine aggregates.

"There are certain clauses common to many specifications which are either impossible of literal fulfilment or introduce an indefiniteness most productive of differences of opinion between producer and consumer.

"It is, of course, possible to obtain 100% passing any given size by using a screen of that size in production. However, such screens will give a material the major portion of which is considerably below the size specified. Much closer conformity to what is desired will be obtained by allowing from 5% to 10% above the nominal top size with a limit of 100% passing the next larger size if the character of the work requires.

"In specifying the bottom limit it is actually impossible to stop 100% on any size in a screening and washing process since a certain proportion of the finer sizes will carry over with the product.

"Such terms as 'free from injurious amounts of' or 'containing no,' applied to silt, clay, organic matter, etc., simply open a fertile field of combat, the violence of which depends upon the personalities and opinions of the parties involved. 'Well graded from coarse to fine,' while a term that seems difficult to avoid under certain specifications, does introduce the matter of personal interpretation. 'To the satisfaction of,' or 'shall be approved by,' when used in an aggregate specification, unless referring to exceptions to the general specification, mean to the producer that he must be well acquainted with the desires and opinions of the 'party in power' and that he must take a chance on either a change of authority or the rulings of an assistant changing the aspect of things.

"A plant can not be set up that will commercially produce materials meeting this multiplicity of requirements. The great variety of top sizes alone would require a number of separations that would be beyond the possibility of practical operation.

"An aggregate as loaded into cars at the plant may meet the mean requirements of a specification and yet by the time this reaches the mixer it may fall outside the limits, due to segregation in handling. This segregation may occur in loading, unloading, stockpiling or distributing. The majority of producers have very considerably reduced the segregation in loading and are constantly experimenting with new ideas in the hope of bettering their results. Segregation in stockpiling may be greatly reduced by using care in building up the stockpile in successive layers, instead of pyramiding it in one operation, while by careful handling during distribution segregation may be held to a minimum.

"Inspection at the point of production has been adopted to a large extent in this district, especially with the more particular consumers. This works out beneficially to both the producer and consumer, as it results in the shipment of material which satisfies specifications and eliminates arguments and rejections at destination. The producer's function is the production of satisfactory material at the plant. What may occur in the line of segregation between plant and mixer is a matter beyond his control but is of vital importance if advantage is to be taken of material which is satisfactory when originally loaded. In inspection in general there are often practices which are unsatisfactory to both principles. In the past a great deal of material has been accepted or regarded on visual inspection.

"The designer, specification writer, producer, and ultimate consumer certainly have one common ground—the production of dependable concrete at a minimum cost.

"Concrete of all classes should not require more than two specifications for fine aggregates: one, written as broadly as is consistent with the requirements, for mass work, heavy structures, and the ordinary run of concrete; and one, with possibly closer limits, for work where

either particular surface finish or exceptional workability are required. Coarse aggregates of three types, or at the most four, should fill all requirements. One should cover mass work, paving, etc., one for ordinary reinforced construction, and one for fireproofing, or very close reinforcement, with possibly a fourth for work of a very special character.

"All of these specifications should be written not only with reference to the technical requirements of the work, but also with due consideration for the practical limitations of commercial production.

"Before consistent and dependable results can be obtained there must be a coordination of specifications and a closer co-operation between the specification writer and the producer of aggregates. Further, the aggregates, after production, must be correctly handled under competent inspection in order that the material may reach the work in the same condition in which it is originally prepared."

A limited discussion followed Mr. Williams' paper, and was opened by Mr. Douglas of Cleveland, Ohio, who asked what methods Mr. Williams was using to get the desired results in his district. Mr. Williams replied that in the Detroit territory a committee had been organized by the Detroit Engineering Society which is made up of representatives of the producers, of the contractors and of engineers. Through the work of this committee it is hoped that the matter may be worked out. Adding to this, Philip Price, of Pittsburgh, Penn., said that just the thing Mr. Williams had suggested had been done in the Pittsburgh district where the engineering society had organized a committee, and the aggregates had been governed through this committee for some time.

Purchase Specifications for Concrete Aggregates

F. H. Jackson, senior engineer of tests, Bureau of Public Roads, presented the report of Committee E-5 on aggregates. This report included a tentative purchase specification for concrete aggregates as worked out by the committee in conjunction with a similar A. S. T. M. committee. The specification defines the general characteristics of fine aggregates and of coarse aggregates. There is a section following each definition giving the maximum allowable percentages of deleterious substances including shale, coal, clay, soft fragments, and organic materials. Following these two sections are two others giving tables of grading of the two kinds of aggregates. For the fine aggregates a test of mortar strength must be the same as for mortar of the same proportions and consistency but made of standard Ottawa sand. Under fine aggregates there is a fifth section stating that if the aggregates pass the maximum size sieve requirement but fail to pass the other requirements, it may still be used if, when tested in combination with the coarse aggregate to be used in the work it attains a strength equal to that of concrete of the same proportion and consistency made with this coarse agregate in combination with another fine aggregate which passes the specifications. Similarly, under coarse aggregates, the specifications provide a section which states that if the coarse does not reach specifications when tested alone, but does when tested with the fine aggregates which will be used on the job, then the coarse aggregate will be considered acceptable.

In delivering his report, Mr. Jackson called attention to one point which had not been satisfactorily worked out yet. This was in the last two sections mentioned above, where it is apparent that if one aggregate which is known to be not quite up to standard is tested against the other aggregate which is unknown in quality, then a result which actually would pass the specifications might be obtained and yet the concrete be not acceptable practically. This condition would be possible when the second aggregate is also poor. The committee suggested another section be added which would provide for testing both the fine and coarse aggregates against known fine and coarse aggregates.

Papers on design and construction of concrete structures followed but included little of direct interest to producers. These included "Specifications for the Small Job" by S. C. Hollister (read by title only) and "Continuity as a Factor in Reinforced Concrete Design" by Hardy Cross of the University of Illinois.

Concrete Symposium

The final day of the convention was taken up with a symposium dealing with standards of performances of concrete for various uses.

The first paper was by ***Harry E. Squire,*** of the Board of State Harbor Commissioners at San Francisco, and was entitled "Concrete for Resisting Sea Water." The paper dealt largely with the action of salt water on breakwaters, piers, etc., and with the design of structures to resist this action. In speaking of aggregates for this work the author says they must be composed of a non-absorbent material, and should be selected with a view to producing uniformity when delivered to the forms. The author continues: "Gravels segregated by washing over screens are generally preferable to crushed rocks which are screened dry and contain varying accumulations of rock dust. The accumulations of fines are particularly annoying as they materially change the cement content of the mortar. On the other hand the practice of adding a small fixed quantity of rock dust, fine sand or diatomaceous earth to produce stickiness and increase uniformity is beneficial if carefully regulated. The use of hydrated lime for this purpose is not desirable in seawater concrete as the calcium hydrate is not inert."

Mr. Squire recommends the use of precast units for this type of work because of the greater facility in placing the concrete and the greater uniformity of the product.

An idea somewhat off the line of concrete for sea water resistance was struck by Mr. Squire when he pointed out that concrete is not a permanent thing, but is only permanent in comparison to other materials because it does last longer. He pointed out that we must consider this factor and use good materials but not try to build for permanence as the first cost expense would more than equal the saving of the added life.

In the discussion which followed Mr. Squire's paper, P. H. Bates, of the U. S. Bureau of Standards, said that he agreed with the author of the paper in regard to the permanence of concrete. He said that engineers and architects ought to show the public that concrete is not a permanent material, although it is more lasting than other materials. He said that the slogan "Concrete for Permanence" was actually a misnomer, and urged the engineers to see that concrete users understand that a concrete structure will eventually have to be replaced and hence they should be preparing to meet the cost of replacement.

Concrete for Pavements

F. H. Jackson, senior engineer of tests, U. S. Bureau of Public Roads, presented a paper on "Special Characteristics of Concrete for Pavements." Mr. Jackson calls attention to the fact that concrete pavements are called upon to withstand greater and more varied destructive agents than almost any other type of concrete structure, and so it is really of small wonder that occasionally they fail. The report indicates that in general the cause of the failure is in the external factors and not in the materials which are used.

In the study of the factors governing road construction and permanence, the Bureau made tests comparing tensile and compressive strengths. The report says: "Experiments conducted by the Bureau of Public Roads and elsewhere have shown beyond question that the resistance of concrete to tension is affected by the character of the aggregates employed to a much greater degree than is the compressive strength. However, these same experiments indicate that for *a given combination* of aggregates and cement, the water-cement ratio governs the tensile and flexural strength fully as closely as the compressive strength. The answer to this, in the writer's opinion, is to use the so-called "trial" method of proportioning the application of which to the design of concrete paving mixtures was described in a

recent issue of *Public Roads*."

One of the factors governing life of concrete roads is the ability to withstand weathering. The Bureau made tests for durability which are reported as follows:

"These tests indicate that although there are certain types of unsound aggregates which will produce unsound concrete even though it may be satisfactory from the standpoint of strength the same factors in general affect durability as affect strength. This applies particularly to the amount of mixing water used, so that given sound aggregates the best insurance against frost action and weathering effects in general still appears to be to employ as low a water-cement ratio as possible consistent with the use of a plastic workable mix.

"Unsound concrete will of course be produced by using unsound aggregates. Such materials as shale, certain varieties of flint, etc., occurring either in the fine or coarse aggregate must be avoided if sound concrete is to be obtained. It is surprising, however, what a wide variety of aggregate types may be employed and durable sound concrete produced provided it has been properly designed and fabricated. It seems safe to say that any material which will pass the sodium sulphate soundness test should prove satisfactory in concrete in so far as durability is concerned. Conversely, failure in this test should subject the aggregate to suspicion until a thorough field investigation at the source has convinced the engineer that it is safe to use."

Mr. Jackson places the blame for the scaling of the surface of pavement almost entirely upon climatic changes. He points out that it is much found on our northern roads and not found at all on southern highways where the road is not affected by frost and alternate freezing and thawing. He says, "Surface disintegration almost always begins on the top of the concrete specimen, and is probably due to the inability of the relatively weak, porous mortar surface to resist disintegration to the same extent as the mass of the concrete." He also states, "Surface scaling followed by disintegration may sometimes be due to the use of unsound aggregates but it would appear that failures from this cause are more or less local and do not compare in extent to the scaling which may be attributed to one or more of the causes above."

In speaking of the necessity of flexural strength in pavements due to the traffic loads the report states: "As has been noted, the water-cement ratio principle may be utilized in the design of concrete for a given flexural strength provided it is recognized at the outset that such factors as angularity and surface texture of aggregates affect the results to a greater extent than in compression. For instance, tests now being made by the Bureau of Public Roads in which 17 typical varieties of coarse aggregates including trap rock, limestone, granites, calcareous and siliceous gravels and blast furnace slags are being investigated, show that for a given mix, grading and water-cement ratio, the maximum variation in flexural strength of concrete made with these aggregates amount to as much as 25% of the average strength. Furthermore, this change in flexural strength was not accompanied by any significant difference in crushing strength, indicating that even quite wide variation in character of coarse aggregate had no appreciable effect upon compression for a given water-cement ratio. This point is emphasized here simply to show that in designing pavement concrete mixtures other factors besides water content, important though it is, must be considered."

The author of the report states that in his opinion the surface wear factor in a concrete pavement can be practically disregarded. He points out that even with relatively soft aggregates there is now practically no surface wear since most of the vehicles using the highways are rubber tired. Present day wear chiefly comes from steel skid chains and these are used so little of the time as to be a negligible factor.

The Bureau in working out aid for states which are using Federal aid road money has developed the following principles:

"(1) The abandonment of volumetric proportioning of aggregates and the adoption of proportioning by weight. Inundation will be recognized as a permissible alternate method for fine aggregate but weighing will be preferred. (2) Maintenance of the lowest water-cement ratio which, with the type, grading and proportions of aggregate and methods of finishing employed, will produce a workable, dense and uniform concrete. (3) The scientific grading of coarse aggregate by combination of separated sizes in each batch in the proportions which will produce the maximum practical density. (4) The abandonment of hand finishing methods."

The fourth principle was recommended, Mr. Jackson said, because it permitted the use of a somewhat larger aggregate, and also because a finishing machine could handle concrete which was so dry that it would be termed "unworkable" by any other method. In the discussion which followed he was asked if there was a limiting size for coarse aggregate, since he had recommended larger sizes. Mr. Jackson replied that in his opinion the limiting size was 2½ in. He added that it would be possible to go to larger size aggregates, but not to more aggregate.

Business Session

At the business session on the afternoon of February 14th, the following officers were elected:

E. D. Boyer, president.

S. C. Hollister, vice-president.

Harvey Whipple, treasurer.

J. C. Pearson, Director, 3rd District (2 years).

P. H. Bates, Director, 4th District (2 years).

A. R. Lord, Director, 5th District (2 years).

President Boyer accepted his re-election in an address in which he emphasized the work which the Institute is carrying on to help the construction industry throughout the country. In closing he referred to the proposed change in the publications of the Institute whereby current technical papers would be published monthly so they would be of greater service to Institute members.

The proposed abandonment of the usual "Proceedings" and the substitution of a monthly publication as suggested by Mr. Boyer was adopted by the convention. The new publication is to be known as the *American Concrete Institute Journal*.

The closing event of the convention was the banquet on the evening of February 14. At this, the Leonard C. Wason medal for the most meritorious paper of the 1928 convention was awarded to F. R. McMillan for his "Concrete Primer." The Leonard C. Wason research medal was awarded to S. C. Hollister, and the Henry C. Turner medal for pioneer work in reinforced concrete was awarded to William K. Hatt. The address of the evening was given by William A. Frayer of the University of Michigan.

Dedication of First Concrete Airport Runway

One of the most interesting parts of the convention was the trip made by the members through the great Ford plant. After leaving the Ford plant, the party went to the Ford airport, where the planes from Chicago arrives, and here saw the dedication of the great new concrete runway just completed. This new construction marks a decided step in the advancement of airport design and it is interesting to surmise what the volume of concrete for future airport development will be.

(Note: Papers given during the sessions of February 13 and 14 which dealt exclusively with cement products have been purposely omitted from the above discussion, and will be reviewed in the cement products section of Rock Products in a later issue.)

Erratum

IN the issue of January 19, in the "Comment on the Ready Mixed Concrete Business," on page 94, the statement was made that Mr. Foster, of the Charles Warner Co., said that "as a handy rule for selling the ready-mixed product, the operator should figure that the return should be just twice as much as would be the sale price of the same amount of materials in a loose condition." This rather ambiguous statement could be interpreted to mean that the Charles Warner Co. was exacting undue profits for its ready-mixed concrete. The rule should read "the operator should figure that the return (or profit) should be just twice as much as the profit made from the sale of the same amount of materials in a loose condition."

Sand-Lime Brick Production and Shipments in January

THE following data are compiled from reports received direct from 22 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is two less than those furnishing statistics for the December estimate published in January 19, 1929, issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

January showed a comparatively small activity in the sand-lime brick business with many of the plants closed down entirely or partially for repairs and replacements. Some reports indicated steady production for the building season. Six plants reported no production at all, and the production for the whole country was lower than in December, 1928. Shipments, both rail and truck, continue to decrease from the figures of the previous month. As is to be expected, the stocks on hand at the mills are considerably larger in preparation for the coming season. Unfilled orders are only slightly lower than in December, and many of these orders are for brick to be delivered in the spring. Prices continue at close to the same figures that were given in the December report.

The following are average prices quoted for sand-lime brick in January.

Average Prices for January

Shipping Point	Plant Price	Delivered
Albany, Ga.	$10.00	$11.50
Boston, Mass.	12.00	16.00
Buffalo, N. Y.	12.25	16.50
Dayton, Ohio	12.50	15.50
Detroit, Mich.	.....	15.50@16.00
Detroit, Mich.	13.00@14.00	15.50@16.00
Flint, Mich.	11.76	.....
Grand Rapids, Mich.	12.50	.....
Hartford, Conn.	14.00	19.00
Jackson, Mich.	12.25	.....
Madison, Wis.	12.50	14.00
Milwaukee, Wis.	10.50	13.00
Mishawaka, Ind.	11.00	.....
New Orleans	.....	.....
Pontiac, Mich.	.....	.....
Saginaw, Mich.	12.00	.....
San Antonio, Tex.	.....	.....
Sebewaing, Mich.	.....	.....
Sioux Falls, S. D.	12.00	14.00
Syracuse, N. Y.	18.00	20.00
Toronto, Canada	12.50	*15.00
Winchester, Mass.	.....	16.00

*Less 5%.

The following statistics are compiled from data received direct from 22 producers of sand-lime brick in the United States and Canada:

Statistics for December and January

	*December	†January
Production	14,925,600	10,548,800
Shipments (rail)	3,765,200	1,674,800
Shipments (truck)	10,163,500	6,206,800
Stocks	15,596,200	16,082,000
Unfilled orders	9,509,000	7,253,000

*Revised to include two plants not furnishing December data previously, 24 plants reporting.

†Incomplete, one plant not reporting stocks on hand and ten plants not reporting unfilled orders.

Southwestern Portland Plans New Mill at Albuquerque

WITH an initial expenditure of $1,500,000, the Southwestern Portland Cement Co., which has large plants at El Paso, Victorville, Calif., and Dayton, O., will erect a cement factory at Albuquerque, N. M., within the next few months, if plans now well under way are carried to completion. Frank H. Powell of Los Angeles, president of the company, said recently that a tentative site has been selected, lime and shale deposits of the best quality in the Southwest have been located, and other details are being arranged that with little doubt will lead to the erection of the plant in Albuquerque.

The plant is to be one kiln, so designed as to permit of additions, as increasing business will demand. It will have a daily production of 2,400 bbl. of cement and will employ about 150 men.

James G. McNary, chairman of board of Cady Lumber Co., and financier of Albuquerque, is treasurer of the company. Many pioneer residents of the state have long been stockholders in the company and some of them were among its founders.

"We have made an expert survey in Albuquerque and New Mexico, to determine the possible demand for cement and also the possibilities of locating the best possible materials for cement making," said Mr. Powell. "The result has been entirely satisfactory. We have found the best materials that could be located anywhere, within a reasonable distance, and we have learned that the demand for cement is growing and that such a plant as we propose to erect will have a market. The increasing interest in irrigation in general, and the projects for conservancy and storage dam building in several parts of the state lead us to believe that there will be a good market.

"It is our belief, also, that Albuquerque is the best location for a plant of this kind, and that it affords advantages in shipping facilities and labor supply. These things have been called to our attention by Mr. McNary and others who are not only interested in the prosperity of the company, but who are also interested in bringing a big industry to Albuquerque.

"The deposits of lime and shale selected by the company, we believe, will make cement of the very finest type.

"The plant we propose to build will be the most modern. It will be dustless, through the use of an electrical process, and the power unit will be of a high type."—*Albuquerque* (N. M.) *Journal.*

H. W. Hawley

H. W. HAWLEY, president of the Los Angeles Rock and Gravel Corporation, Los Angeles, Calif., died February 15, in Los Angeles at the age of 66.

He was born in Deseret, Utah, and his early business life was spent in assisting his father in the transportation and freighting business. When yet in his twenties he was twice elected sheriff of Millard county, Utah. In 1900 he moved to Seattle, where for twelve years he engaged in the contracting business. While in Seattle he took the contract for the removal of Denny Hill, situated in the heart of the Seattle business district. Approximately 10,000,000 yd. were moved on this job. He was also responsible for the building of the Beacon Hill reservoirs in Seattle, and the Mt. Tabor reservoirs in Portland, Ore. For the past fifteen years he has been actively engaged in the rock and gravel business in Los Angeles. In addition to heading the Los Angeles Rock and Gravel Corp., he was also president of H. W. Hawley and Co., president of the First National Bank of Brea, and a director of the West Side State Bank and the Hollywood State Bank. A lasting monument to his memory is the playground which he has given to the city of Los Angeles free of rental, and which is being used as a junior aviation field.

H. W. Hawley

A Visit to British Quarry Managers' Convention*

Some Facts About British Quarries and British Quarry Operations

By W. E. Farrell
President, Easton Car and Construction Co., Easton, Penn.

TWO YEARS AGO, prompted by a desire to see something of British quarries, I arranged to take my vacation at an English watering place or spa, called Harrogate, because there the Institute of Quarrying was to hold its annual meeting.

The English association corresponds to our National Crushed Stone Association, except that it also includes slate, sand and gravel producers.

Their association makes more of the machinery exhibition than we do. A large field, as near the hotel as possible, is rented and there the manufacturers erect booths and install their exhibits. The shovels are put through their paces; the trucks do imaginary loading and dumping; and the engines "do run," for they are installed on concrete foundations.

I soon learned that colloquial technical American is one thing and technical English another. For instance, a shovel is a "navvy," or at best an "excavator," a quarry car a "wagon," a truck is a "steamer" or a "lorrie," crushed stone is referred to as "metal," and I never did learn what a "whinstone quarry" is.

I was an early American attendant, if not a real Columbus, and they were exceedingly kind in seeing that I met everyone, so I soon felt at ease except for one thing. I had gone expecting to speak for ten minutes on American quarries, but was informed that I was down as one of the speakers at the annual banquet. There was no getting out of it, so until that was over I was not really very happy. They held their business sessions in the morning; sightseeing, amusements or visits to the exhibition in the afternoon; followed by banquets and dancing every evening.

No one could say after such an experience that the English are not sociable nor that they have no sense of humor. Their humor is neither so coarse nor cutting as ours, more a harmless play on words, or a pun. They know more about playing than we do. There were all kinds of contests; foot races, thread the needle, etc., etc. Withal it was a real English holiday and not so strenuous an affair as our American vacation.

*Extracts from a talk before the National Crushed Stone Association, Cleveland, Ohio, January 23, 1929.

In the two weeks previous to the convention, friends took me by motor to see some of their quarries. I want you to grasp an idea of the size of England, else you will feel some of the disappointment I did in regard to their operations. England, including Wales, is 57,000 square miles, or, say, 200 miles wide by 300 long. Illinois has an area of 56,000 square miles and is about 218 wide by 285 long. Visualize the quarry industry of such a state with three to four times its number of quarries and no demand for stone for concrete highways, or ballast or skyscrapers, and you will soon realize why the quarries are small compared to many of ours, and why churn drills, shovels, large crushers, etc., are rare.

W. E. Farrell

Equally surprising will be the idea that most quarries own or lease their railroad cars and ship their material in them. Concrete highways to anything like the extent we have them are in the dim and very distant future. They would require too much straightening of their roads.

English quarrymen have a sense of beauty that we do not possess, hence if possible a quarry is located where there is scenery. Take as an instance the one on the Bay of Mounts, facing the city of Penzance, almost at Land's End; or away north of this in Wales is another, on the Irish Sea, just around the corner from that beautiful resort at Lundidno. If not on water, then they are perched on top of a high hill, where the manager, as he greets you, says, "Just look about, you can see seventeen counties from here."

I was impressed by the prevalence of the jaw crusher and the smallness of the customary size, also a preference for several small crushers rather than one or two of large size. I have seen by a recent article that the crusher 6x4 ft., weighing 133 tons, a size previously imported, has just been made in England.

I recently had from S. McPherson, secretary of the Institute of Quarrying, a letter in which he gives me some information which might be of interest to you.

Although all the main roads are as a rule tar macadam, concrete or asphalt, the second- and third-class roads, where limestone is used, are frequently grouted with a tar compound.

Excluding limestone, about 50% of the product of the hard-stone quarries is shipped in a dry state in the form of chippings. In explanation of this, all of their roads every year are treated with what they call tar spraying. That is, the roads are sprayed with tar compound and liberally sprinkled with chippings. In fact, there is an inclination to so treat all their roads to avoid any slipperiness.

Apparently a very small quantity of crushed stone is used for railways in the form of ballast, as, on account of the low cost, slag is generally used for this purpose.

According to available information, the amount of stone used in England last year for road-making was approximately 13,000,000 tons, of which 8,000,000 was of igneous rock and 5,000,000 tons limestone. In addition to this there was used for road-making approximately 1,642,000 tons of sandstone and 823,000 tons of gravel. What they call igneous rock includes all kinds of hard stone such as granite, basalt, etc. The term trap rock is rarely or never applied to stone.

Concerning the output of some of their larger quarries, Mr. McPheson refers me to one in Scotland which produces over 1000 tons per day. He mentions another at Leicester of about 2000 tons per day, and says that two or three others supply an equal amount. In fact, in one case he says he knows of an operation of 4000 tons per day.

Hints and Helps for Superintendents

An Inexpensive Moisture Detector

WILLIAM A. ERNST
Rapid City, South Dakota

IN a wet process cement plant it is customary to dry the slurry, which is brought into the laboratory for analysis, in small pans over a hot plate and then to analyze the dry material for its calcium carbonate content.

Portions of the same sample are also used to determine the number of bbls. per inch of dry material in a tank of slurry. It is therefore very important that all traces of moisture be driven off, since if this is not done, errors in the calculation of the proportions necessary to blend two or more tanks in making the final mix are very apt to follow.

If the slurry has been carefully spread over the bottom of the drying pan in a thin, uniform layer, it is easy to believe, after a certain period of drying at the end of which the mass appears dry to the eye, that it is dry. This, however, is frequently far from the fact, since if the slurry should be thicker at one point in the pan than at the other points, then it quite likely that this portion is not as dry as the remainder of the material in the pan. This might or might not be noticed when the cooled sample is ground up for analysis. If it is detected, the sample must be put back and dried a second time, and consequently valuable time is wasted.

To minimize errors due to optical observations, the writer experimented with a frosted glass plate, in order to be certain that the last traces of moisture were removed. This is accomplished by taking the apparently dry sample away from the source of heat and holding the frosted side of the glass close to the surface of the dried slurry for a moment. Any traces of moisture will collect on the glass, producing a dark spot which is more readily recognized than it would be if the glass were not frosted. Care must be taken not to leave the glass in contact with the heated surface too long, since it will absorb the heat rising from the dried sample, and consequently evaporate the traces of moisture collected without leaving a dark spot.

The frosted glass is easily made by any one. All that is necessary is to cut a small piece of ordinary glass to the desired size (a 4 x 4-in piece of window glass is a convenient size) cover it with valve grinding compound, and rub down with any flat surface until the degree of frosting desired is produced.

Moving Boulders and Stumps with a Tractor

CALIFORNIA climate, it is said, makes things grow big, and perhaps that is why contractors in that western state have considerable trouble with large boulders that impede the progress of road construction. The two accompanying views show what the contractor was up against in two California jobs where it was necessary to clear a roadway through broken country upon which large rocks were heavily strewn. The "Caterpillar" tractors shown in the pictures were secured to the stones or stumps by means of a chain or a wire rope, and the obstruction was pulled to one side with little difficulty. Such methods of clearing could easily find application for sand pits, both in California and in other sections where similar conditions are to be met, since stripping must be done and often roadways must be opened.

Stone Chutes

W. L. HOME
Fort Lee, N. J.

STONE chutes in a crushing plant are to a certain extent necessary. Also it is conceded that they are to the same extent a necessary evil. Where chutes are to be used in crushing plants the plant must be built larger in every way to allow for the necessary distance and heights to give them the proper inclination for the stone to run freely. They are a source of dust, are expensive to keep in repair and, for the most part, can be done without (with a decided economic advantage) by the use of bins, feed boxes and conveyor belts.

Chutes are rarely at the proper angle for all conditions. If the chutes are not sufficiently steep they will choke up under the least provocation, especially if the fines and dust are damp or if there is a worn place or any other irregularity for the stone to catch on. If the chutes are too steep, a small volume of stone travels at a high velocity, hammering and cutting as it goes. If the stone travels at a low rate of speed and in a larger volume the same amount of stone could be delivered with but little wear and tear on the chute. Unfortunately if a chute is steep enough not to choke up, the velocity will be excessive. A remedy for this could only be accomplished by building a chute tight on four sides, set on a steep

Opening a roadway through rough country with the aid of a tractor

Clearing a boulder-strewn strip of timber land with a tractor to help

angle and with a gate on the bottom to regulate the flow. This would almost be classified as a bin and would require heavy construction to support the weight.

Where it is possible to use them, bins or feed boxes and conveyor belts are without doubt more satisfactory than chutes. Where chutes must be used, however, the best of materials should be used to line them. A failure in a chute lining is often expensive.

Although large production plants are able and compelled to put on special linings of various sorts, for the average plant ordinary high carbon spring steel at a price of but little more than the regular plates is about as good a material as can be had. Untempered spring steel can be secured in quite an assortment of widths and thicknesses, but except by special order from the mills cannot be had in any width as can the ordinary plate. Hence, odd-size spring steel then becomes expensive. Build your chutes to fit what spring steel plates can be bought from stock and there will then be no empty spaces and no cutting will have to be done. Putting in the narrow strips is perhaps economy after all, as the wear usually comes in but a small section of the iron anyway and with the narrow plates but little iron would be wasted.

Spring steel can be drilled by using high speed tools at slow speed. Tempered spring steel cannot be drilled but would probably last longer than the untempered steel. However, it is many times more expensive. Under average conditions the untempered will last sufficiently long so that the cost per ton is remarkably low.

Building Up Worn Steam Shovel Teeth

I. W. EGER

System Welding Supervisor, Denver & Rio Grande Western, Denver, Colo.

(From *Railway Engineering Maintenance*)

THE apparatus shown in the illustration is designed for building up worn steam shovel teeth. It consists of an old air reservoir cut to a length of 40 in. with a piece of ¼-in. material welded in for the head. On the inside of one end a 6-in. hinge is welded, to which is attached a slotted upright on which the shovel tooth is bolted ready for building up. When attached, the tooth is bent over in position for welding, the spring holding the arm and tooth above the surface of the water. In building up a small tooth a 6-in. air brake cylinder spring is sufficient but in working on the larger teeth it is necessary to insert a 4-in. spring inside the larger one to provide for additional tension. The springs are held in place by a lug welded to the bottom of the tank.

To insure the building up of the tooth to standard size and also to prevent drawing it off to one side while welding, it is advisable to use a template, which is constructed of ¾-in. square iron and fitted around a new tooth to get the proper taper. With the worn tooth bolted in place and covered by the template, a piece is cut from the leaf of a locomotive spring, shaped at the bottom to the contour of the worn tooth and of sufficient length to fill the space to the end of the template. This piece of steel is used to build around. The quenching lever shown is of sufficient length and is so shaped that it can be worked with the foot while the electrodes are being changed.

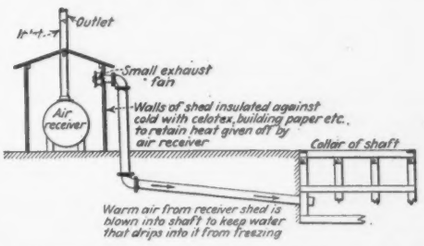
Care should be taken to see that the work progresses from the dipper tooth towards the point, thereby eliminating unnecessary strains at the line of fusion with the manganese point. One-quarter inch high carbon coated rods should be used and a deep penetration secured in the manganese; at the end of each electrode the quenching lever should be pressed down with the foot to immerse the work in the water. As soon as the electrodes are changed, the quenching lever is released and the spring raises the tooth out of the water, sufficiently cooled to enable operations to be resumed without danger of breaking the new work, as manganese will crumble if it becomes overheated. The importance of quenching will be more easily understood if we remember that manganese metals contain 13% of manganese, and being very volatile in a molten state, will pass off into the atmosphere and leave a brittle condition at the line of fusion if not cooled promptly. The work should be cooled after the application of each 14-in. electrode. It will also be noted that considerable time is saved by quenching, as work can be resumed at once.

The high carbon rod is built on the tooth until it is of standard size; then the template is removed and a layer of non-machineable metal is laid completely over the added metal, extending up the sides of the tooth and overlapping the original metal on the face as well as the sides. In this connection when a steam shovel is used in slag or other abrasive substances, it is advisable to put a $\frac{1}{16}$-in. coating of non-machineable metal on the surfaces that receive the most wear before a new tooth is put into service.

By the use of this method it is not necessary to have the teeth drawn out in the blacksmith shop before welding. The cost of this work averages $1 a tooth, thus saving about $16 on the cost of a new tooth. It has been found by actual experience that a tooth so built up lasts about twice as long as a new one. With this quenching tank it is possible to deposit from 8 to 10 lb. of electrode per hour.

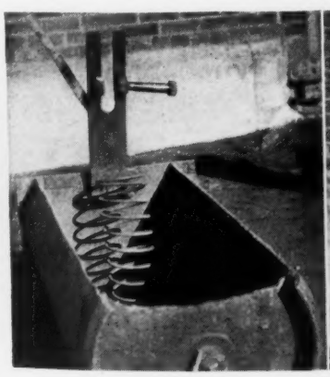
Simple Arrangement Utilizes Heat from Air Receiver

IN COLD CLIMATES it is customary to expect trouble as a result of the freezing of water around the collar of a mine shaft.


Outlet
Small exhaust fan
Air receiver
Walls of shed insulated against cold with celotex, building paper etc., to retain heat given off by air receiver
Collar of shaft
Warm air from receiver shed is blown into shaft to keep water that drips into it from freezing

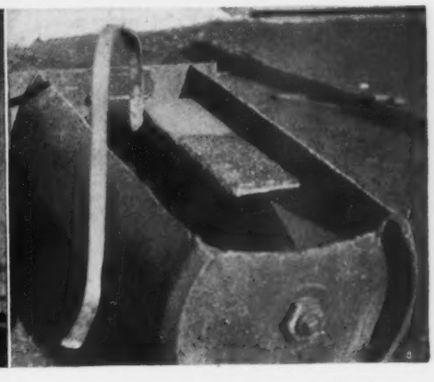
Arrangement for utilizing the heat given off by an air receiver

This has been avoided at the Wright-Hargreaves property, at Kirkland Lake, Ont., by an ingenious utilization of the heat given off by an air receiver, which is housed in a small building with insulated walls. Near the roof an exit with exhaust fan is provided for connection to a ventilating pipe delivering to the shaft, as shown in the sketch.—*Engineering and Mining Journal.*



The improvised tank for building up shovel teeth

The tank with template on the upright. The insert shows two of the shovel teeth



A tooth bent over in position for welding

Crushed Gypsum Remains on Free List

U. S. Treasury Department Ruling After Very Thorough Investigation

THE CONTROVERSY which has been waged between domestic gypsum producers and manufacturers, and domestic manufacturers who import their crude gypsum from mines in Nova Scotia and elsewhere, seems finally settled by a letter dated February 4, 1929, signed by A. W. Mellon, secretary of the United States Treasury Department, addressed to the collector of customers at New York City, which reads as follows:

"In a letter dated June 12, 1928, the Department advised you that in its opinion crushed gypsum was properly dutiable as ground gypsum at the rate of $1.40 per ton under paragraph 205 of the tariff act, but as it was the practice to admit crushed gypsum free of duty as crude gypsum under paragraph 1643, you were authorized to continue that practice until 30 days after the letter appeared in the weekly 'Treasury Decisions.' However, so many protests were received from importers of crushed gypsum against the proposed assessment of duty on crushed gypsum that it was deemed wise to withhold publication of the letter of June 12, and to grant a hearing to importers and others concerned so that the question might be fully considered and the Department might have the benefit of the arguments of both sides. This hearing was held in the Bureau of Customs on July 20, was largely attended by importers and domestic interests.

"At the hearing the importers contended that the crushed gypsum imported into this country from Canada was entitled to admission free of duty as crude gypsum and samples were filed by them illustrating what in their view is ground gypsum within the meaning of paragraph 205 and what crude gypsum within the meaning of paragraph 1643. Later briefs were filed by the attorneys representing the importers and the domestic producers and these briefs have been read with care, as well as the authorities cited therein, and have been of assistance to the Department in reaching its conclusion as to the proper classification of crushed gypsum.

"The importers contend that as the crushing of the gypsum is for purposes of expeditious handling and for ease of transportation, it is not a process of manufacture and that the gypsum is still crude within the meaning of that term as used in paragraph 1643. The domestic producers, on the other hand, contend that even if it be conceded that the process of crushing was for the purpose of facilitating the handling of the gypsum, nevertheless the crushing is a process of manufacture, and that even if it be held that in its condition as imported the gypsum is not 'ground' as the term is used in paragraph 205, it is an article wholly or partly manufactured and dutiable as such at the rate of 30% ad valorem under paragraph 214 of the tariff act.

"The Department, in its letter of June 12 above referred to, invited attention to the fact that there does not appear to be any clear-cut definition distinguishing articles crushed from articles ground, and that these terms are frequently used to describe the same process. It would appear, however, by reference to the standard dictionaries that while the terms 'crushed' and 'ground' are used interchangeably, the word 'ground' is ordinarily used to describe an article reduced to fine particles or which has been pulverized.

"In the opinion of the Department the term 'ground' as used in the tariff act is intended to refer to a product which is, in the condition imported, ready for its ultimate use and does not apply to an article, even though crushed, if the preliminary crushing is merely for ease and economy in handling and convenience in transportation. In support of this attention is invited to the decision of the United States Circuit Court for the Southern District of New York, T. D. 25917, which held that refuse cork which had been coarsely ground for greater convenience in shipping was not a manufacture of cork within the meaning of paragraph 448 of the tariff act of 1897, but was still waste and dutiable as such under paragraph 463 of the said act.

"Referring to the suggestion of the domestic interests that if crushed gypsum is not dutiable as ground gypsum under paragraph 205, it is, nevertheless, dutiable as an earthy or mineral substance under paragraph 214, I think that a careful reading of the decisions holding that the crushing of rock is a manufacture will show that the decisions are predicated upon the finding of fact that the rock in its condition as imported was ready for its ultimate use, and the only exception to this line of decisions that has come to the Department's attention is T. D. 37396, which held that stone which had been put through a process of crushing to reduce it in size varying from ⅓ in. to 10 in. was not a crude mineral but was a manufactured product, notwithstanding it was not ready for its ultimate use but was subjected to further processes after it reached this country. It is proper to note with respect to this decision that the importers could not file an appeal for a review of the decision because the merchandise was held to be free of duty under another paragraph of the tariff act; that is, as silicic acid under paragraph 387 of the tariff act of 1913.

"The term 'crude' as used in the tariff act has been the subject of much litigation and the courts have ruled upon many different articles and have ruled that the fact that an article has been subjected to manufacturing process does not of itself exclude it from classification as crude, nor is the term 'crude' confined to something which is in a natural or raw state. In Merch v. United States, T. D. 34549, the court states that crudeness is a relative term and whether an article is crude is to be determined, not by the processes which brought it into being, but by the additional processes to which it is submitted after its creation in order to fit it for its chief or only use. This announcement would seem to apply with particular aptness to crushed gypsum.

"On account of the importance of the issue involved in this case the Department has given careful consideration to the arguments advanced by the conflicting interests and has granted several hearings since that of July 20, and in addition had a further investigation made by an investigating officer of this Department who followed the various operations from the time the gypsum was quarried in Canada until its complete manufacture in this country. The purpose of this investigation was to determine whether the operations in Canada in bringing the gypsum to a crushed state dispensed with operations in this country.

A very exhaustive report was submitted by the investigating officer and from a perusal thereof the Department is not inclined to the view that the crushing in Canada would be held by the courts to be a process of manufacture, and this conclusion would seem to be justified in view of the report of the investigating officer that the cost of the crushing in Canada is approximately 2 c. per ton, and the report of the officer would seem to be in harmony with a monograph published by the Deputy Inspector of Mines in Canada, dated January 8, 1926, in which he gives the value of lump gypsum as $1.80 per ton and the value of the crushed as $1.82 per ton. The investigating officer also states in his report that the costs of the operations in Canada are approximately ½ of 1% of the total cost of operations.

"In view of the foregoing, and the reasoning announced in the decisions cited above, the Department has reached the conclusion that crushed gypsum of the character the subject of its decision of June 12, 1928, is neither crude gypsum nor gypsum wholly or partly manufactured, but is crude gypsum within the meaning of paragraph 1643 and entitled to admission free of duty as such under the said paragraph. For the reasons stated the Department concluded to withhold publication of its letter of June 12, supra."

Editorial Comment

A Peek at the Future?

We make no apologies for the the space devoted in this issue to a description of the new quick-hardening portland cement plant of the Missouri Portland Cement Co. It is sufficient to note that it is the *first* plant specifically conceived and designed to make this product. The one dominant feature of design is accurate control of every step in manufacture; especial care in processing is essential. It is in the *details* of the plant that interest lies; hence we have gone into details. Many forward-looking portland cement manufacturers believe that future progress of the industry is in more accurate every-day control of manufacturing processes.

Voids in Aggregate

The National Sand and Gravel Association and the National Crushed Stone Association have finished their preliminary studies of voids in concrete aggregate and have published their reports. These studies were to show the relation between the grading of aggregates and the percentage of voids, and the information derived promises to be increasingly important to the producers of these aggregate materials. For it is evident that we are entering into a new era of designing concrete mixes in which the characteristics of the aggregate used will be taken into account to a much greater degree than they have been heretofore. No one contends that we will get stronger or more permanent concrete than could be obtained by the usual methods of design but we will get it somewhat more cheaply.

F. H. Jackson's paper in *Public Roads* for August, 1928, treated the matter in some detail. Stanton Walker in his introduction to the study of voids in gravel and sand shows that comparatively slight changes in grading may so change the percentage of voids in the aggregate that from 3 to 5% more cement may be required for ordinary mixes. And A. T. Goldbeck, in his introduction to the study of voids in crushed stone, says that the recommendation by the United States Bureau of Public Roads is a guarantee that principles of design involving the voids and some other characteristics of aggregate will be widely used.

The basic facts brought out by these studies of voids were already known. Those familiar with aggregate gradings knew that with three component mixes the lowest voids were obtained with mixtures of the coarse and fine and that as the intermediate size is added the voids tend to increase. It was also known that crushed stone usually contained more voids than gravel for the same grading. But this merely means that more fine aggregate has to be used with crushed stone than with gravel to obtain the same strength of concrete with equal cement contents. Mr. Goldbeck has shown this and it is in effect the fourth of the principles of design laid down in F. H. Jackson's paper. And it was further known, as brought out in these studies, that many gradings might produce the same void content and that slight alterations in grading would increase or diminish the percentage of voids. So far as fine aggregates are concerned, the studies of Prevost Hubbard and others on asphalt sands showed these things to be true some time ago.

The great value of these studies, not only to the aggregate producer but to the concrete engineer, lies in the fact that they are so systematic and so complete. Every grading possible with the three groups of sizes was covered for all three materials, which means in a practical way that every grading within the maximum and minimum size limits was covered. The charting on triaxial diagrams permits anyone to take the screen analysis of an aggregate and determine approximately what the voids are. Something of far more importance is that one may see what changes in grading are necessary to lessen the percentage of voids. Mr. Goldbeck in his study has covered this portion of the work admirably, showing that many gradings may be made so as to keep the percentage of voids within 2 or 2½% of a minimum without sacrificing a large part of the crusher product.

And these studies are of further value in recalling the importance of considering the voids in aggregate. In the earlier attempts to design concrete mixes the voids were the first thing considered. The earliest theory of design called for sufficient fine aggregate to fill the voids in the coarse aggregate and sufficient cement and water to fill the voids in the fine aggregate. The classical 1:2:4 mix had its origin in this theory. Later studies of voids developed Fuller's curve, the grading of greatest density for the aggregate plus the cement. But methods based on voids are incomplete in that they take no account of the factor actually governing the strength of concrete, the water-cement ratio. And they did not consider workability, mixes based on voids alone often being harsh and unworkable. So void methods were forgotten and the fineness modulus of the aggregate and its relation to the water-cement ratio became the basis of design. Recently the work of the North Carolina Highway Commission and the papers of Jackson, Walker and Goldbeck have shown that the most economical as well as scientifically designed concrete demands more than this. It demands a consideration of the other characteristics of the aggregate, and the percentage of voids is one of the most important of these characteristics.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	2-27-29	91	93	
Alpha P. C. new com.	2-25-29	54	56	75c qu. Apr. 15
Alpha P. C. pfd.[2]	2-25-29	116	.....	1.75 Mar. 15
American Aggregates com.	2-27-29	48	50	75c qu. Dec. 1
Amer. Aggregate 6's, bonds	2-27-29	112	113½	
American Brick Co.	2-25-29	.....	17	25c qu. Feb. 1
American Brick Co. pfd.	1-14-29	89	94	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]	2-27-29	101	102	
American Silica Corp. 6½'s	2-27-29	96	100	
Arundel Corp. new com.	2-26-29	41⅞	42	50c qu. Jan. 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	2-27-29	No market		
Atlas P. C. com.	2-25-29	48	52	50c qu. Dec. 1
Atlas P. C. pfd.	2-25-29	50	60	66⅔c qu. Jan. 2
Beaver P. C. 1st 7's[20]	2- 8-29	99	100	
Bessemer L. & C. Class A[4]	2-25-29	35¾	36½	75c qu. Feb.1
Bessemer L. & C. 1st 6½'s[4]	2-25-29	99¾	101	
Bloomington Limestone 6's[29]	2-27-29	91	93	
Boston S. & G. new com.[16]	2-25-29	19	21	
Boston S. & G. new 7% pfd.[16]	2-25-29	50	52	
Canada Cem. com.[43]	2-25-29	30	31	
Canada Cem. pfd.[43]	2-25-29	98½	99	1.62½c qu. Dec. 31
Canada Cement 5½'s	2-22-29	101	102	
Canada Cr. St. Corp. 1st 6½'s	2-23-29	95	98	
Canada Gyp. & Alabastine	2-25-29	99¾	100	75c Jan. 2
Certainteed Prod. com.	2-26-29	21¾	22	$1 qu. Oct. 1
Certainteed Prod. pfd.	2-26-29	55½	60	1.75 qu. Jan. 1
Cleveland Stone new st'k	2-26-29	59¼	75	50c qu.. 25c ex. Mar. 1
Columbia S. & G. pfd.	2-25-29	95¼	96	
Consol. Cement 1st 6½'s, A[42]	2-27-29	93	96	
Consol. Cement 6½% notes	2-27-29	90	95	
Consol. Cement pfd.[29]	2-27-29	50	60	
Consol. S. & G. com. (Canada)	2-25-29	17	17½	
Consol. S. & G. pfd. (Canada)	2-25-29	94	.....	1¾% qu. Nov. 15
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	2- 8-29	98	99½	
Coosa P. C. 1st 6's[29]	2-27-29	50	55	
Coplay Cem. Mfg. 1st 6's[40]	2-27-29	90	.....	
Coplay Cem. Mfg. com.[40]	2-27-29	15	.....	
Coplay Cem. Mfg. pfd.[40]	2-27-29	75	.....	
Dewey P. C. 6's[30]	2-27-29	99	.....	
Dolese & Shepard[7]	2-26-29	118	122	$2 qu. Apr. 1
Edison P. C. com.[19]	2-25-29	50c	.....	
Edison P. C. pfd.[19]	2-25-29	1	.....	
Edison P. C. bonds[19]	2-25-29	75	.....	
Giant P. C. com.	2-25-29	38	.....	
Giant P. C. pfd.	2-25-29	30	40	3½% Dec. 15
Ideal Cement, new com.	2-25-29	80	82	75c qu. Jan. 2 & 50c ex. Dec. 22
Ideal Cement 5's, 1943	2-25-29	107	110	
Indiana Limestone 6's	2-26-29	90¾	91½	
International Cem. com.	2-26-29	93½	94½	$1 qu. Dec. 28
International Cem. bonds 5's	2-26-29	111¼	112	Semi-ann. int. payable June 15
Iron City S. & G. bonds 6's[40]	2- 9-29	95	99	
Kelley Is. L. & T. new st'k	2-26-29	54	60	62½c qu. & 50c ex. Jan. 2
Ky. Cons. Stone Co. com.[48]	2-21-29	13	15	
Ky. Cons. St. com. Voting Trust Certif.[48]	2-21-29	13	15	
Ky. Cons. Stone 6½'s*[48]	2-21-29	96	100	
Ky. Cons. St. Trustee Certif.[48] (1 Sh. 7% cum. pfd. & 1 sh. com. stock)	2-21-29	98	100	1.75 Nov. 1
Keystone Sand & Sup. 6's[47]	8-22-28	99	100	
Lawrence P. C.[2]	2-25-29	95	100	2% qu. Sept. 29
Lawrence P. C. 5½'s, 1942	2 -6-29	95	.....	
Lehigh P. C.[2]	2-26-29	61	61½	62½c. qu. Feb. 1
Lehigh P. C. pfd.[2]	2-26-29	110	110½	1¾% qu. Apr. 1
Lyman-Richey 1st 6's, 1932[13]	2-23-29	99	100	
Lyman-Richey 1st 6's, 1935[13]	2-23-29	97½	99	
Marblehead Lime 1st 7's[34]	Called at 108			
Marbleh'd Lime 5½'s, notes[34]	Called at 100¼–100½			
Material Service Corp.	2-26-29	36½	40	50c qu. Mar. 1
Mich. L. & C. com.[6]	2-25-29	35	.....	
Missouri P. C.	2-26-29	48½	50	50c qu. Feb. 1
Monolith Midwest[9]	2- 7-29	8	10	
Monolith P. C. com.[9]	2-21-29	15	.....	8% ann. Jan. 2
Monolith P. C. pfd.[9]	2- 7-29	8¾	9¼	
Monolith P. C. units[9]	2- 7-29	33½	35½	
National Cem. (Can.) 1st 7's[38]	2-22-29	99	101	
National Gypsum A com.	2-26-29	14	17	
National Gypsum pfd.[35]	2-26-29	48	50	1¾% qu. Apr. 1
Nazareth Cem. com.	2- 8-29	27	30	75c qu. Apr. 1
Nazareth Cem. pfd.	2- 8-29	102	105	
Newaygo P. C. 1st 6½'s[29]	2-27-29	102	.....	
New Eng. Lime 1st 6's[14]	2-23-29	98	100	
N. Y. Trap Rock 1st 6's	2-26-29	100¼	.....	
North Amer. Cem. 1st 6½'s	2-26-29	72	74½	
North Amer. Cem. com.	2-27-29	10	14	
North Amer. Cem. 7% pfd.	2-27-29	30	35	1.75 qu. Aug. 1
North Amer. Cem. units	2-27-29	34	38	
North Shore Mat. 1st 5's[15]	2-27-29	98½	.....	
Northwestern States P. C.[37]	2-23-29	195	206	
Pac. Coast Cem. 6's, A	2-23-29	92¾	96½	
Pacific P. C. com.	2-23-29	28½	31	
Pacific . P. C. pfd.	2-23-29	80	84	1.62½ qu. Jan. 5
Pacific P. C. 6's	2-23-29	98¾	.....	
Peerless Egyp'n P. C. com.[21]	2-25-29	2	2½	
Peerless Egyp'n P. C. pfd.[21]	2-25-29	85	90	1¾% qu. July 1
Penn-Dixie Cem. 1st 6's[29]	2-26-29	94½	94⅞	
Penn-Dixie Cem. pfd.[28]	2-26-29	88	90	1.75 qu. Mar. 15
Penn-Dixie Cem. com.	2-26-29	21¾	22	50c qu. July 1
Penn. Glass Sand Corp. 1st 6's, 1952	2-6-29	103½	104½	
Penn. Glass Sand pfd.	2-6-29	112	.....	
Petoskey P. C.	2-26-29	10¼	10¾	1½% qu.
Riverside P. C. com.	2-21-29	20	.....	
Riverside P. C. 1st pfd.	2-23-29	95	97	1.50 Aug. 1
Riverside P. C., A.	2-21-29	18	.....	31¼c cum. part. Aug. 1
Riverside P. C. B.	2-14-29	1	2	
Sandusky Cem.	2-26-29	255	260	$2 qu. Jan. 1 & $4 extra
Santa Cruz P. C. bonds	2-23-29	105¾	.....	6% annual
Santa Cruz P. C. com.	2-23-29	92	.....	$1 qu. Jan. 1 & $2 ex. Dec. 24
Schumacher Wallboard com.	2-21-29	16½	17¾	50c May 15
Schumacher Wallboard pfd.	2-21-29	23	24¾	
Southwestern P. C. units[44]	2- 8-29	270	.....	
Superior P. C., A[20]	2-21-29	47¼	48	27½c mo. Mar. 1
Superior P. C., B[20]	2-21-29	30½	31	
Trinity P. C. units[37]	2-23-29	156	165	
Trinity P. C. com.[37]	2-23-29	50	.....	
U. S. Gypsum com.	2-26-29	62¼	62½	2% qu. Mar. 31
U. S. Gypsum pt. paid	2-26-29	46	48	
U. S. Gypsum pfd.	2-27-29	.....	120	1¾% qu. Mar. 31
Universal G. & L. com.[3]	2-27-29	.....	50c	
Universal G. & L. pfd.[3]	2-27-29	5	10	1½% Feb. 15
Universal G. & L., V.T.C.	2-27-29	No market		
Universal G. & L. 1st 6's[3]	2-27-29	50	60	
Chas. Warner com.	2-25-29	.....	49	50c qu. Jan. 12 & 50c extra
Chas. Warner pfd.	2-25-29	109	.....	1¾% qu. Jan. 24
Whitehall Cem. Mfg. com.[36]	1-30-29	150	.....	
Whitehall Cem. Mfg. pfd.[36]	1-30-29	98	.....	
Wisconsin L. & C. 1st 6's[15]	2-27-29	100	.....	
Wolverine P. C. com.	2-26-29	6	7	15c qu. Feb. 15
Yosemite P. C., A com.[20]	2-14-29	.....	10	

*Ann. interest due May 1 and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago. Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [43]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney Williams & Co., Inc., Los Angeles, Calif. [46]Stein Bros. & Boyce. Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd. (sand-lime brick) 16 sh.[6]	par 25	25¾
Benedict Stone Corp. 1st 7's 1934[5]	.....	86
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	.....
River Road Sand and Gravel Co.,[9] 200 shares	$21 per share	.....
River Road Sand and Gravel Co.,[11] 219 shares	$55 per share	.....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	.....
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....
Winchester Rock Brick Co. pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	.....
Winchester Brick Co. pfd.[10] 250 sh. (par $10)	$100 for the lot	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price at auction by R. L. Day & Co., December 26, 1928. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L Day & Co., Boston, Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [8]Auction sales of $1000, Barnes & Lofland, Philadelphia, March 31, 1928. [9]Price obtained at auction by Barnes & Lofland, Sept. 26, 1928. [10]Price at auction Dec. 19, 1928, R. L. Day & Co., Boston, Mass. [11]Price at auction, Nov. 21, 1928, by Barnes & Lofland.

Recent Dividends Announced

Dolese & Shepard (quar.).....$2.00, Apr. 1
Indiana Limestone pfd. (quar.)..$1.75, Mar. 1
International Cement (quar.)....$1.00, Mar. 28
Material Service (quar.)..... 50c Mar. 1
Superior Port. Cement (quar.)..27½c Mar. 1

Financing of the Consolidated Rock Products Co.

THE NEW FINANCING in connection with the formation of the Consolidated Rock Products Co., Los Angeles, Calif., is entirely from the sale of stock—an innovation so far as the rock products industries are concerned. The stock is being offered by a group of investment bankers in units of two shares of preferred and one share of common for $58 per unit. Details of this stock issue are given as follows in a letter by S. W. Burford, president of the company:

BUSINESS AND TERRITORY—The Consolidated Rock Products Co. was recently incorporated in Delaware for the purpose of consolidating the business and properties of the Union Rock Co. and its subsidiaries, the Consumers Rock and Gravel Co., Inc., and its subsidiaries, and the Reliance Rock Co.

The company, the largest of its kind in the world, will own and lease through its subsidiaries valuable sand, gravel and rock deposits strategically located throughout the territory which it serves,—from Santa Barbara county on the north to San Diego county on the south and east to San Bernardino, all inclusive. Its operating subsidiaries manufacture, sell and distribute crushed rock, washed and screened gravel and sand for use in the construction and maintenance of railroads, highways, streets, buildings and irrigation, flood control and reclamation projects. Their products are staple, basic commodities used in large quantities in all structural and concrete work. The Union Rock Co. and the Consumers Rock and Gravel Co., Inc., were pioneers in the industry. The consolidating companies do over 75% of the business in the territory which they serve and their annual sales are in excess of 8,000,000 tons.

During recent years between 100 and 150 miles of highways in Los Angeles county alone have been paved, improved and reconstructed; the constant development of all territory in and adjoining the city of Los Angeles requires improvement work on highways in excess of past performance, together with an extensive flood control program with concrete sewers, dams and bridges. The city itself is growing very rapidly as an industrial center, and it is believed this growth and development in all of the territory served by the constituent companies will assure a constant increase in sales of the Consolidated Rock Products Co.

PROPERTIES—The company will own and operate through its subsidiaries 23 producing plants, all of which have a combined production capacity of 4500 tons per hour. It will in a like manner own and operate 21 distributing bunkers strategically located, with a combined storage capacity of 48,000 tons, and in addition, it has 10 sites for future storage yards and bunkers embracing approximately 100 acres.

The sand, gravel and rock deposits consist of 2015 acres owned in fee, and 2836 acres controlled under lease. The estimated sand, gravel and rock content of these lands is in excess of 1,000,000,000 tons, which is sufficient to meet the company's requirements for 100 years, on the basis of the present rate of production. Through the network of railways owned by the Pacific Electric railway, the Southern Pacific Co. and the Atchison, Topeka and Santa Fe railway, all production plants and bunkers are inter-connected, thus assuring rapid and relatively cheap delivery of materials to the various bunkers and to the consumer. These transportation facilities are most excellently augmented by paved state highways available for deliveries by truck.

Beside the plants and operating equipment, the company will own and operate through its subsidiaries 4½ miles of private railroad with necessary locomotives, hopper-bottom cars, steam shovels and locomotive cranes. Over 200 motor trucks of automatic self-dumping type are owned by the consolidating companies, many of which are divided into compartments for delivery of assorted material, in proportions as specified, direct to the concrete mixer.

EARNINGS—The formation of the Consolidated Rock Products Co. will bring under one control all factors necessary to achieve the usual economies resulting from a consolidated management. The new company will have the power to operate particularly efficient plants at maximum capacity and to allocate territory to various plants so as to eliminate trucking cross-hauls heretofore a heavy expense to the constituent companies. Normal competition will remain, but the consolidation of 75% of the production capacity in the Los Angeles territory will prevent abnormal competition and at the same time assure better service to the consumer. Consolidated earnings of the consolidating companies, as estimated below, for the first year's operations reflect the more important savings which will be effected. Earnings for the 12 months ending June 30, 1930, are estimated by the management as follows:

ESTIMATED EARNINGS STATEMENT

Net after depletion, depreciation, etc.	$1,600,000
Annual bond interest	233,700
Balance	$1,366,300
Federal income tax	164,000
Balance	$1,202,300
Preferred dividends	525,000
Balance	$ 677,300

The above earnings would represent approximately $4 per share available for preferred stock dividends, and would show a balance equal to about $1.70 per share on the common stock outstanding. These earnings, in view of the participating features of both classes of stock, would leave approximately $0.40 additional per share for each class after payment of dividends at the annual rate of $1.75 per share on the preferred stock and $1 on the common stock. The estimated provision for depreciation, depletion, etc., which is in excess of $900,000 per year, will provide an amount more than sufficient to meet maximum sinking fund charges on the mortgage debts of the consolidating companies as now outstanding, in addition to funds necessary for capital expenditures incident to normal growth of the business.

The historical earnings of the constituent companies may not be taken as a true criterion of the earning power of this company, owing to former abnormal competitive conditions, duplication of delivery routes and to other phases of the situation, all of which are largely rectified by combining the interests of the heretofore separate units. As a result of present financing the company will be in a strong current position and will have ample working capital.

APPRAISALS—Plants, land, leaseholds and equipment of the Union Rock Co., the Consumers Rock and Gravel Co., Inc., and the Reliance Rock Co., and their respective subsidiaries, as valued by the J. G. White Engineering Corp., on May 5, 1928	$15,091,200
Additional properties acquired since that date by the above companies as recently valued by independent appraisers	1,571,800
Total appraised value	$16,663,000

CAPITALIZATION—Upon completion of the present financing the capitalization of the company will be as follows:

	Authorized	Outst'ding
Funded debt of merged companies	$7,500,000	$3,895,000
$1.75 dividend preferred stock, no par (this issue), shs.	300,000	300,000
Common stock, no par, shs.	*700,000	†400,000

*300,000 shares common stock reserved for conversion of preferred.
†Not to exceed this amount.

PREFERRED AND COMMON STOCK PROVISIONS—The cumulative convertible participating $1.75 dividend preferred stock is without par value, has full voting rights, is preferred as to assets and cumulative dividends from March 1, 1929, over the common stock and will be entitled in voluntary liquidation to $30, and in involuntary liquidation to $25, per share and accrued dividends, and is redeemable in whole or in part on any dividend date upon 60 days' notice at $30 per share and accrued dividends. It is entitled to cumulative preferential dividends over the common stock of $1.75 per share annually, accruing from March 1, 1929, which will be payable quarterly. After the common stock has received dividends of $1 per share in any fiscal year, the preferred stock will participate equally with the common stock in any additional dividends, share for share.

The preferred stock is convertible at any time at the option of the holder, up to and including the tenth day prior to the date of redemption as fixed by any call, into an equal number of shares of common stock.

The company's certificate of incorporation provides, among other things, substantially as follows:

(a) That without consent of the holders of at least two-thirds of the outstanding preferred stock the company will not:

(1) Authorize the issuance of any preferred, common or other class of stock in addition to the shares of preferred and common stock presently authorized.

(2) Sell, lease or dispose of substantially all the assets of the company.

(3) Amend or alter provisions of the certificate of incorporation relative to preferences of the present preferred stock, or

(4) Incur any indebtedness which does not mature within one year from the date of the incurrence thereof, except purchase money obligations, leases or contracts which the board of directors may deem advisable in the maintenance or operation of the business of the company and generally assumption of obligations of subsidiaries and/or refunding obligations.

(b) That no new or additional preferred stock shall be issued except upon the terms that the then existing preferred stock-

holders shall have the prior right to subscribe for and take such additional preferred stock. The same preemptive right exists in favor of common stockholders as to new or additional issues of common stock.

(c) That both preferred and common stockholders are accorded full voting rights, except that in case at any time four consecutive quarterly cumulative dividends on the preferred stock become in arrears, the preferred stockholders thereupon become entitled to elect a majority of the board of directors.

PURPOSE OF ISSUE—The preferred and common stock to be presently outstanding will be issued by the Consolidated Rock Products Co. in part for the acquisition by it of substantially 100% of all the outstanding capital stock either directly or through subsidiary corporations, of each of the consolidating companies, for additional working capital and for other corporate purposes.

OWNERSHIP AND MANAGEMENT—Due to the constructive nature of this consolidation and the many resulting benefits to the Los Angeles district, a number of strong interests long identified with the community have become actively interested in the new company.

BOARD OF DIRECTORS—The board of directors comprises the following prominent business men:

Fred S. Albertson, director, Pacific American Fire Insurance Co., director, International Re-Insurance Co.; Harry J. Bauer, director, Southern California Edison Co., director, California Bank; S. W. Burford, president, Consolidated Rock Products Co.; George L. Eastman, president, Fidelity Savings and Loan Association, treasurer, Los Angeles Chamber of Commerce; I. Eisner, president, Sun Realty Co., director, Union Bank and Trust Co. of Los Angeles; L. L. Elliott, president, the Elliott-Horne Co.; Frank Gautier, Consumers Rock and Gravel Co., Inc., director, Gautier Land Co.; John D. Gregg, Consumers Rock and Gravel Co., Inc.; Nels Gross, president, District Bond Co.; Ralph B. Hardacre, executive vice-president, Los Angeles-First National Trust and Savings Bank, director, Pacific Indemnity Co.; Robert E. Hunter, president, Hunter, Dulin and Co., director, Citizens National Trust and Savings Bank; W. P. Jeffries, president, Los Angeles Investment Co., president, Jeffries Banknote Co.; Norman B. Livermore, director, Pacific Gas and Electric Co., director, Crocker 1st National Bank of San Francisco; Reese Llewellyn, chairman, Executive Committee Consolidated Steel Corp., director, Columbia Steel Corp.; E. J. Nolan, president, Bank of America of California, director, Pacific Investing Corp.; B. F. Nysewander, director, Consolidated Steel Corp.; Donald O'Melveny, vice-president, E. H. Rollins and Sons, vice-president, American Equities Co.; Stuart O'Melveny, first vice-president, The Title Insurance and Trust Co., director, Mortgage Guarantee Co.; Fred B. Ortman, vice-president, Gladding, McBean and Co., director, Los Angeles-First National Trust and Savings Bank; Lee A. Phillips, executive vice-president, Pacific Mutual Life Insurance Co., president, Pacific Indemnity Co.; George A. Rogers, chairman, Consolidated Rock Products Co.; Lawrence L. Rogers, Union Rock Co.; O. Rev Rule, executive vice-president, Pacific Finance Corp., director, Citizens National Trust and Savings Bank; Fred J. Toole, president, Toole-Tietzen and Co.; Ford Twaits, executive vice-president, Consolidated Steel Corp; George M. Wallace, vice-president, Security Trust and Savings Bank, director, International Re-Insurance Corp.

International Cement Earnings for 1928

INTERNATIONAL CEMENT CORP. reports for the year ended December 31, 1928, net income of $5,129,284 after depreciation, interest and reserve for federal taxes and contingencies, equal, after preferred dividends to $7.87 a share on 618,826 common shares as compared with $4,554,172 or $6.89 a share in 1927. For the quarter ended December 31, the company reports a net income of $1,514,909 or $2.44 a share on 618,826 common shares as against $1,417,916 or $2.29 a share in the preceding quarter and $1,271,194 or $1.95 a share on 562,500 common shares in the fourth quarter of 1927. The preferred stock was called on May 20, 1928.

Giant Portland Cement Co. Annual Report

CHARGES TO PROPERTY account amounted to $87,619.91. The principal item in this amount is for the construction of a new electrical substation at the Reliance mill at a cost of approximately $75,000, and made necessary by changes in transmission voltage by the Pennsylvania Power and Light Co. Property account has been credited with $125,163.67 from depreciation account and amount written off on account of retired machinery, which had not been fully credited through depreciation fund. Expenditure of $155,628.37, charged to operating expenses, has maintained the plants at the usual standard of efficiency. Bonds to the amount of $32,000, due April 1, 1928, have been paid and cancelled. A material reduction in sales volume, due to the importation of foreign cement, made curtailment of production necessary. Sales contracts for the coming year are about normal and it is believed there will be no material decrease in the consumption of cement during the year 1929.

Regular semi-annual dividends of 3½% on the preferred stock were paid on June 15 and December 15, 1928.

INCOME ACCOUNT—GIANT PORTLAND CEMENT CO.

For the Year Ended December 31, 1928

Net profit from operations after providing for depreciation, local and state taxes		$220,321.26
Other Income:		
Bank and other interest, etc.		11,550.44
		$231,871.70
Deduct:		
Interest on bonds	$ 3,900.00	
Other interest	1,995.31	
Reserved for federal income tax	31,565.04	
		37,460.35
Net income from operations		$194,411.35
Less:		
Loss on dismantling machinery, etc.		19,540.60
Balance transferred to surplus		$174,870.75

BALANCE SHEET AS AT DECEMBER 31, 1928—GIANT PORTLAND CEMENT CO.

ASSETS

Current assets:			
Cash			$ 220,903.59
U. S. certificates of indebtedness—Par $100,000			100,343.75
Loaned on collateral demand notes			100,000.00
Notes and accounts receivable		$82,742.32	
Less reserve for trade discount	$3,752.96		
Less reserve for bad debts	12,158.69		
		15,911.65	
			66,830.67
Sundry debtors			2,556.79
Rents and interest receivable			1,654.83
Inventories:			
Raw materials		$ 19,654.28	
Finished stock and clinker (less reserve for packing, loading and sack handling)		224,778.52	
Supplies		181,688.30	
			426,121.10
Total current assets			$ 918,410.73
Deferred charges:			
Insurance prepaid			10,565.80
Bonds and stocks owned			2,346.63
Fixed assets:			
Real estate, buildings, machinery, etc., depreciated value			2,874,713.48
			$3,806,036.64

LIABILITIES

Current liabilities:			
Accounts payable		$51,671.14	
Customers' credit balances		1,880.99	
Payroll and unclaimed wages		15,499.43	
Accrued interest and taxes		26,130.73	
Total current liabilities			$ 95,182.29
First mortgage 6% serial gold bonds:			
Bonds outstanding, of which $28,000 mature April 1, 1929			57,000.00
Reserve for contingencies, etc.			18,804.23
Capital stock:			
Preferred stock outstanding, 37,600 shares of $50 par		$1,880,000.00	
Less held in treasury, 172 shares		8,600.00	
			1,871,400.00
Common stock outstanding, 22,200 shares of $50 par		$1,110,000.00	
Less held in treasury, 117 shares		5,850.00	
			1,104,150.00
Surplus:			
Balance as at December 31, 1927	$615,627.37		
Balance transferred from income account	174,870.75		
		$790,498.12	
Less dividends paid		130,998.00	
			659,500.12
			$3,806,036.64

Lime Industry Starts Organization of Regional Statistical Bureaus

ONE REGIONAL statistical bureau—embracing lime manufacturers in Michigan, Wisconsin, Minnesota, Illinois, Missouri, Indiana, Arkansas and Texas—has already been organized and is functioning; and a second comprising the lime manufacturers in New England and New York is in the process of organization. This is the first step in bringing order out of the present chaotic condition in the lime industry.

Through the generosity of the Central States lime manufacturers, who worked out their scheme of organization at much expense of time, trouble and money, we are permitted to give the essential details here, in the hope that lime manufacturers in other localities will profit by their experience. This organization is now known as the Central Lime Manufacturers' Statistical Bureau, with headquarters in Chicago.

The purpose of this Bureau is the collection and dissemination to the members of the Bureau of accurate information concerning the following matters pertaining to the manufacture and sale of lime by the members of this Bureau, who are engaged in the manufacture of lime in the area covered:

(*a*) Capacity of plants;
(*b*) Production of burned lime;
(*c*) Shipments of lime;
(*d*) Sales of lime.

The purpose of the Bureau also includes the ultimate dissemination to the public of the information collected by the Bureau.

The affairs of the Bureau are managed by an administrative committee of three chosen by the members, and such officers, agents and employees as the by-laws may prescribe or the administrative committee may determine. The constitution provides that the Bureau may be terminated or suspended at any time upon the request, in writing, of two-thirds of the then members, provided that all such members joining in such request shall first pay all dues and assessments owing to the Bureau, and provided further, that no such termination or suspension shall relieve any member of its financial obligations to the Bureau. Every member of the Bureau is absolutely free to conduct its business in its own way in every respect and particular, and is not in any way controlled by this Bureau.

The by-laws provide that the administrative committee may withdraw the service of the Bureau from any member for: (*a*) Failure to pay dues or assessments within thirty days after the same become due; or (*b*) Failure to conform to the constitution and by-laws of the Bureau. *Provided* ten days' notice and an opportunity to be heard shall first have been given to such member.

All dues and assessments are distributed among and paid by the members of the Bureau pro rata, according to the number of tons of lime burned by such members respectively during the preceding calendar year. Dues and assessments are fixed or authorized at meetings of the members. The administrative committee is authorized to levy special assessments upon the members to provide for deficiencies in the funds of the Bureau.

Periodical reports of receipts and disbursements must be rendered to each member as follows: Each member shall forward to the Statistician for the Bureau, not later than the 10th of each calendar month, on the blank form or forms provided for that purpose, a statistical statement covering the preceding calendar month, showing approximate annual capacity of its plant or plants, and its production, shipments and sales of lime for the preceding month.

The information sent out to members of the Bureau is given to all members at the same time, and no advance reports are given to any member.

When the information received by the Bureau from its members is compiled and distributed by the Bureau to its members generally, as in these by-laws provided, the compilations thereof are also to become available to the public at the office of the Bureau and through such other agencies as the administrative committee may, from time to time, determine and authorize.

No information or data, whatever, other than that thus provided on said forms, are collected or distributed by the Bureau. Information received from any member is not without the permission of such member, distributed in such form as to identify it with the company furnishing the same.

Forms Used

Below is the form used by manufacturers to report to the statistician.

In using the report form the following definitions are to be applied:

1. CAPACITY—In reporting the maximum annual capacity of plant, compute the number of tons of lime which can be burned and processed ready for sale with equipment now owned and in operating condition, assuming operation of the plant at maximum capacity during the entire year of 365 days.

2. LIME BURNED—Report under this heading the tonnage of burned lime taken from the kilns, and *not* the tonnage of raw material charged into the kilns.

3. SHIPMENTS—Report under this heading only lime actually leaving the plant during the month and for which invoices have been rendered to customers. The aggregate selling price of product shipped is to

CENTRAL LIME MANUFACTURERS STATISTICAL BUREAU
STATISTICAL REPORT OF
.....COMPANY
FOR MONTH OF....., 192.....

		Physical Quantities (Net Weight)	Aggregate Selling Price*
1.	Maximum annual capacity of plant (in tons of burned lime)	.....	.....
2.	Number of tons of lime burned during month	.....	.....
3.	Shipments made during month:		
	(a) Tons of barrel lime	.....tons	$.....
	(b) Tons of quick lime in bags	.....tons	$.....
	(c) Tons of hydrated lime in bags	.....tons	$.....
	(d) Tons of bulk lime	.....tons	$.....
4.	Sales during month:		
	(a) For immediate delivery	.....tons	$.....
	(b) For future delivery	.....tons	$.....

*F. O. B. Plant, including packages, but excluding freight, cartage, and commissions.

Blank used by member companies in reporting to Statistical Bureau

be reported f. o. b. your plant, including packages, but not including amounts billed for freight or cartage. All commissions must be deducted in computing such aggregate selling price.

4. SALES—Report under this heading only signed contracts or bona fide orders for immediate or future delivery which have been booked during the month. "Sales for immediate delivery" mean sales for delivery within thirty days from date of order. Under "Sales for future delivery" should be reported the entire tonnage of sales for delivery later than thirty days from date of order. All actual commitments for the sale and delivery of lime must be reported, but no estimated requirements or prospective orders of customers should be included. No sale is to be reported until and unless actually closed. The aggregate selling price of product sold is to be reported f. o. b. your plant, including packages, but not including amounts billed for freight or cartage. All commissions must be deducted in computing such aggregate selling price.

Summary Return Report

Each month the statistical bureau furnishes its members with the following summary, compiled from the company reports:

CENTRAL LIME MANUFACTURERS STATISTICAL BUREAU
STATISTICAL REPORT FOR MONTH OF....., 192.....

Number of companies reporting		.....
Maximum annual capacity of companies reporting (tons of burned lime)		.....
Production of burned lime during month		.....
Shipments during month:	Quantities (Net Weight)	Aggregate Selling Price*
	.....	.....
(a) Barrel lime	.....tons	$.....
(b) Quick lime in bags	.....tons	$.....
(c) Hydrated lime in bags	.....tons	$.....
(d) Bulk lime	.....tons	$.....
Sales during month:		
(a) For immediate delivery	.....tons	$.....
(b) For future delivery	.....tons	$.....

*F. O. B. Plant, including packages but excluding freight, cartage, and commissions.

Form used by the Statistical Bureau to summarize data for member companies

American Aggregates Corp. to Build Plant at New Miami, in Ohio

ANNOUNCEMENT was made on February 15 that negotiations had been completed by the American Aggregates Corp. of Greenville, Ohio, for the purchase and lease of considerable acreage north of the plant of the Hamilton Coke and Iron Co. at New Miami, Butler county, Ohio. Immediate construction of a large gravel plant is planned.

The company has plants in Ohio, Indiana and Michigan, all located at strategic points for the distribution of gravel to centers of population in the adjoining states.

It is expected that building of the new plant will entail an expenditure of about $100,000 and will mean when in operation the employment of about 50 men. A capacity of 50 carloads of gravel daily will be provided for in the new plant. F. D. Coppock of Greenville is president of the corporation. —*Dayton* (Ohio) *Herald.*

Missouri Portland Merges Sand Business with Two Other Producers to Form New Company

THE formation of a $4,500,000 sand and gravel company to take over the sand and gravel business of the Missouri Portland Cement Co. of St. Louis, the Mississippi River Sand and Material Co. and the St. Charles Sand Co. was announced on February 13 with the filing of an application for incorporation. The new corporation will be known as the Standard Materials Co. and will operate independently of the Missouri Portland Cement Co., which will confine its activity to the cement business.

It is understood that Conrad G. Besch, vice-president of Missouri Portland, will be president of the new company, and City Collector Edmond Koeln of St. Louis and former Judge Charles H. Daues of the St. Louis Court of Appeals, president and secretary, respectively, of Mississippi River company, will be directors.

For the purposes of the merger, the Missouri Portland's sand and gravel interests have been appraised at about $3,400,000, the Mississippi River Sand and Material Co. at $700,000 and the St. Charles Sand Co. at $60,000. The Missouri Portland plant is at the foot of Tyler street in St. Louis and the company has several material yards scattered through the city. The Mississippi Valley Sand plant is at the foot of Victor street.—*St. Louis* (Mo.) *Post-Dispatch.*

Ceramic Show in Chicago Has Exhibits of Rock Products Producers

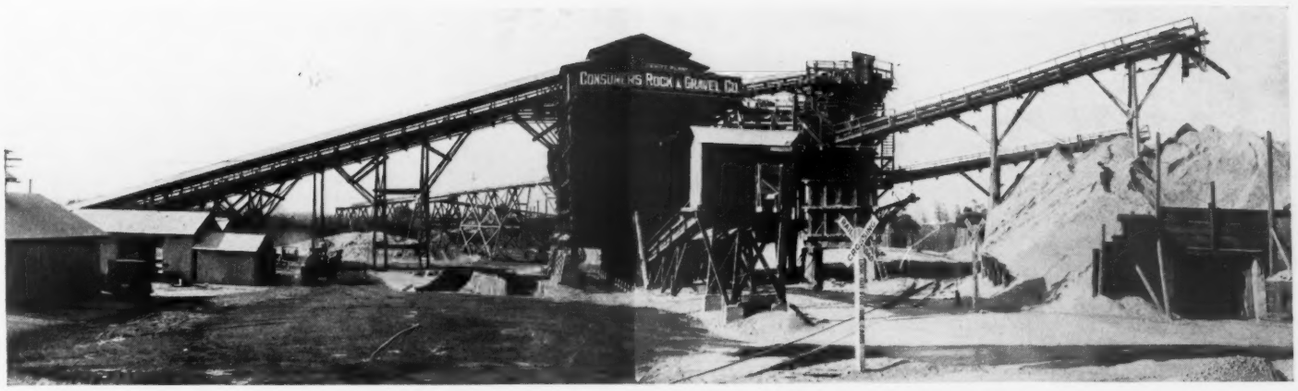
A NUMBER of rock products producers were represented at the exposition of the ceramic industries presented by the American Ceramic Society at the Stevens hotel in Chicago during the week of February 4 to 9. Notable among these producers were the United States Gypsum Co., the Consolidated Feldspar Corp. and the Pennsylvania Pulverizing Co. The United States Gypsum Co. displayed a number of samples of raw materials as well as several products manufactured from gypsum. Technical representatives were on hand to detail the uses and methods of production of gpysum. The Pennsylvania Pulverizing Co. of Pittsburgh, Penn., showed a number of samples of the products they produce, including feldspar, silica rock and similar substances. Numerous photographs of the company's various operations were displayed.

The Consolidated Feldspar Corp. of Trenton, N. J., is the new firm which groups together many of the leading feldspar producers of the country. Its exhibit included both raw products and finished samples, emphasizing chiefly the fine products which can be produced from the company's materials. The machinery manufacturers were also well represented at the Ceramic exhibition, the equipment shown including shovels and excavators, vibrating screens, trucks, recording instruments and many other varieties.

Columbia Silica Company's Akron, Ohio, Plant Damaged by Fire

OFFICIALS of the Columbia Silica Co. of Akron, Ohio, are making plans to rebuild the company's plant at Copley, which was burned in a bad fire on the night of February 11. Pierce Snyder of Akron, who is president of the concern, said that work would be started immediately on the reconstruction, to make it possible to meet the many unfilled orders which the company now has.

Fire officials are investigating to ascertain the cause of the blaze which started in a conveyor shaft in a screen room. Ralph Francisco, an employe, saw the smoke curling out of the conveyor. He turned in an alarm and then attempted to put out the flames with a fire extinguisher. However, the flames spread too quickly and a score of other employes who hastened to the scene were forced to wait until arrival of Akron and Fairlawn fire companies. When these arrived the building was nearly gone. In addition to loss on the building, Mr. Snyder said, 300 to 400 tons of sand were also lost. The machinery was badly damaged. The total loss was placed at $100,000.—*Medina* (Ohio) *Gazette.*



Panoramic view of the Hewitt plant of the Consumers Rock and Gravel Co., which becomes one of the units of the Consolidated Rock Products Co.

Recent Rock Products Developments in Southern California

Formation of Consolidated Rock Products Co., and Los Angeles Cement "War" Hold Center of the Stage

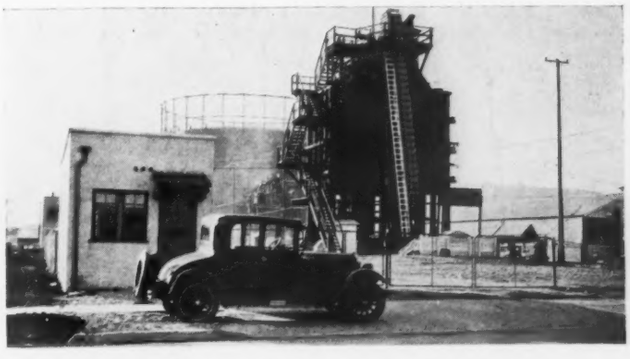
By Edmund Shaw
Contributing Editor, Los Angeles, Calif

THE formation of a merger to include the plants producing the greater part of the sand, gravel and crushed rock output of the Los Angeles district was announced February 15. This merger has been incubating for some time and various combinations of companies have been suggested as the possible members. As announced it is composed of the Consumers Rock and Gravel Co., Inc., the Union Rock Co., the Reliance Rock Co., "and others," the names of the others presumably to be announced later. The announcement was made by Lee A. Phillips who is a capitalist well known in the financial circles of the West Coast. The merger is to be known as the Consolidated Rock Products Co., and it was formed by the sale of the companies to a syndicate, the deal being put through by Mr. Phillips in cooperation with three of the large banking and investment companies of Los Angeles. S. W. Buford is to be president of the combination and the board of directors is composed of Lee A. Phillips, Ford Twaits, O. Rey Rule, W. P. Jeffries, Norman B. Livermore, I. Eisner, Ralph B. Hardacre, Fred B. Ortman, B. F. Nysewander, Jr., Fred B. Albertson, George M. Wallace, Harry J. Bauer, George L. Eastman, L. L. Eastman, L. L. Elliott, Stuart O'Melveny, S. W. Buford, Reese Llewellyn, E. J. Nolan and George A. Rogers.

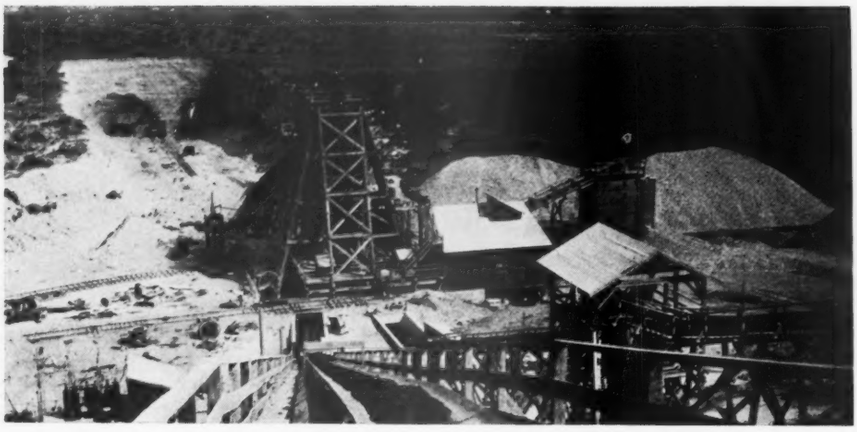
Conditions in the District

One who is familiar with the conditions in the Los Angeles district will probably agree that this particular merger is a good thing whether he believies that mergers are generally a good thing for the industry or not. For the district was probably as good an example of the mess that unrestrained investment in plants and equipment can produce as any in the country. The competitive situation that grew out of this was so bad that something had to be done. One who is familiar enough with the situation to make an authoritative statement tells me that about $33,000,000 is invested in plants, lands and equipment and that the total capacity of the plants, not counting those which are obsolete or otherwise unfit to work, is not far from 34,000,000 tons. At times when building is good the production runs up to 15,000,000 tons a year but at the present time it is probably in the neighborhood of 12,000,000 tons. The merger plants are producing a little over 8,000,000 tons a year,

Baldwin Park plant of the Union Rock Co., which becomes another unit of the Consolidated company



The Hollywood bunker of the Consumers Co., now controlled by the Consolidated company



Crushing unit and excavation at the Reliance Rock Co. plant which forms part of the new merged company

or three-fourths of the total, and the capitalization of the merger is stated to be $11,000,000. This seems a reasonable amount when it is taken into account that the plants are combinations of sand and gravel washing plants and rock crushing plants, and that they require more and heavier machinery and equipment and larger bins than plants of the same capacity in many other parts of the country. In addition there is a heavy investment in distribution facilities as so large a part of the distributing is done by truck.

Owing to the overplanted condition, the Los Angeles district has been the battle ground of a price war that has lasted for years. There have been armistices for short periods and the hope that through association and better acquaintanceship the producers might be brought to end the warfare, but it has gone on just the same. No one can tell at this writing just what the prices of sand and crushed rock are here. One man whose sources of information are the best tells me that, "You can buy sand for from nothing to 40 cents a ton and rock for from 40 cents to 60 cents a ton." Production costs are said to be 40 cents, at least, so it is evident that a good deal of business has been done at less than the cost of production. Everyone knows, in fact, that a great deal of business has been done at a loss, and if the merger of companies can stabilize the industry and maintain a price that will give those who have invested their money a fair return it will eventually be better for everyone, including, of course, the public that buys and uses the product.

The Consolidated Rock Products Co. will own and operate 23 producing plants with 18 "bunkers" for distribution which have a combined capacity of 48,000 tons. Many of these bunkers are large structures, fitted with elevating and conveying machinery, that cost as much to build as the ordinary producing plants. The lands of the new company include 1807 acres owned and 2636 acres leased.

War Over New Cement Plant

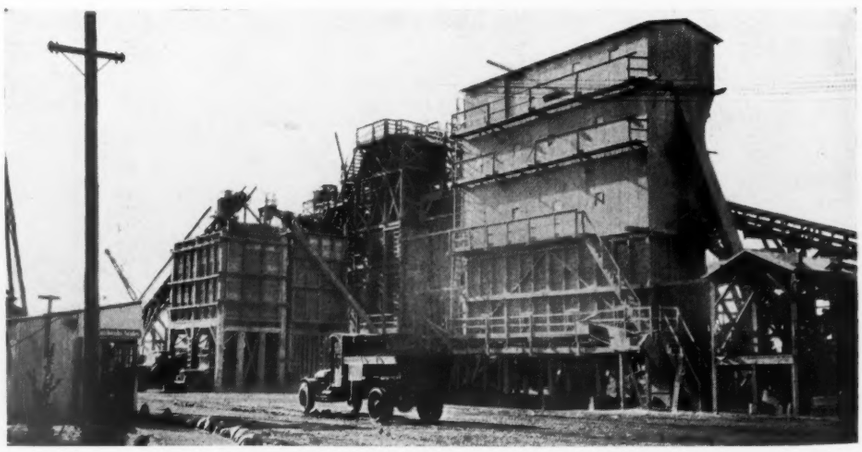
Never in the history of the cement industry has such a to-do been raised over the building of a plant as has been caused by the proposal of Alphonse Bell and his company to put the raw material end of a cement plant in Santa Ynez canyon. The protest raised by residents of that part of the city was sudden and violent and it appears they like a cement plant for a neighbor about as much as a man would like a yellow dog full of fleas for a bedfellow. The newspapers jumped into the row with both feet and considered it important enough to hold it on the front page even while a city attorney was being tried for bribery and a judge was being investigated on another serious charge. The fact that one paper approved of the plant was perhaps a reason for others to oppose it and to publish long statements from "well known engineers" and "prominent cement experts," while Will Rogers furnished the necessary comic relief by gravely applying for permission to build a fertilizer factory.

Out of the welter of words one gains the impression that no one is going to be seriously harmed and that the proposed plant will not be a nuisance to even the nearest resident provided that it is as dustless and as nearly noiseless in its operation as some cement plants are. And the proposed method of transporting the material, grinding it to slurry and then pumping it through a four-mile pipe line with the aid of gravity is interesting from the engineering point of view. At the same time it is to be questioned if southern California needs another cement plant. The four companies already operating there said in the course of the recent state senate investigation that they could supply the entire market without running to capacity all of the time, which does not look as though there were such a need. Add to this that the imports of foreign cement seem bound to increase, owing to the recent action of the city council in removing some of the restrictions on its use in public works construction. The sale of cement ground from imported clinker is expected to begin soon and there is a fair chance that a plant will soon be built in an industrial town nearby whose inhabitants will gladly welcome a new industry. So if the plant in Santa Ynez canyon is not built the district will probably be able to worry along with what cement it can get.

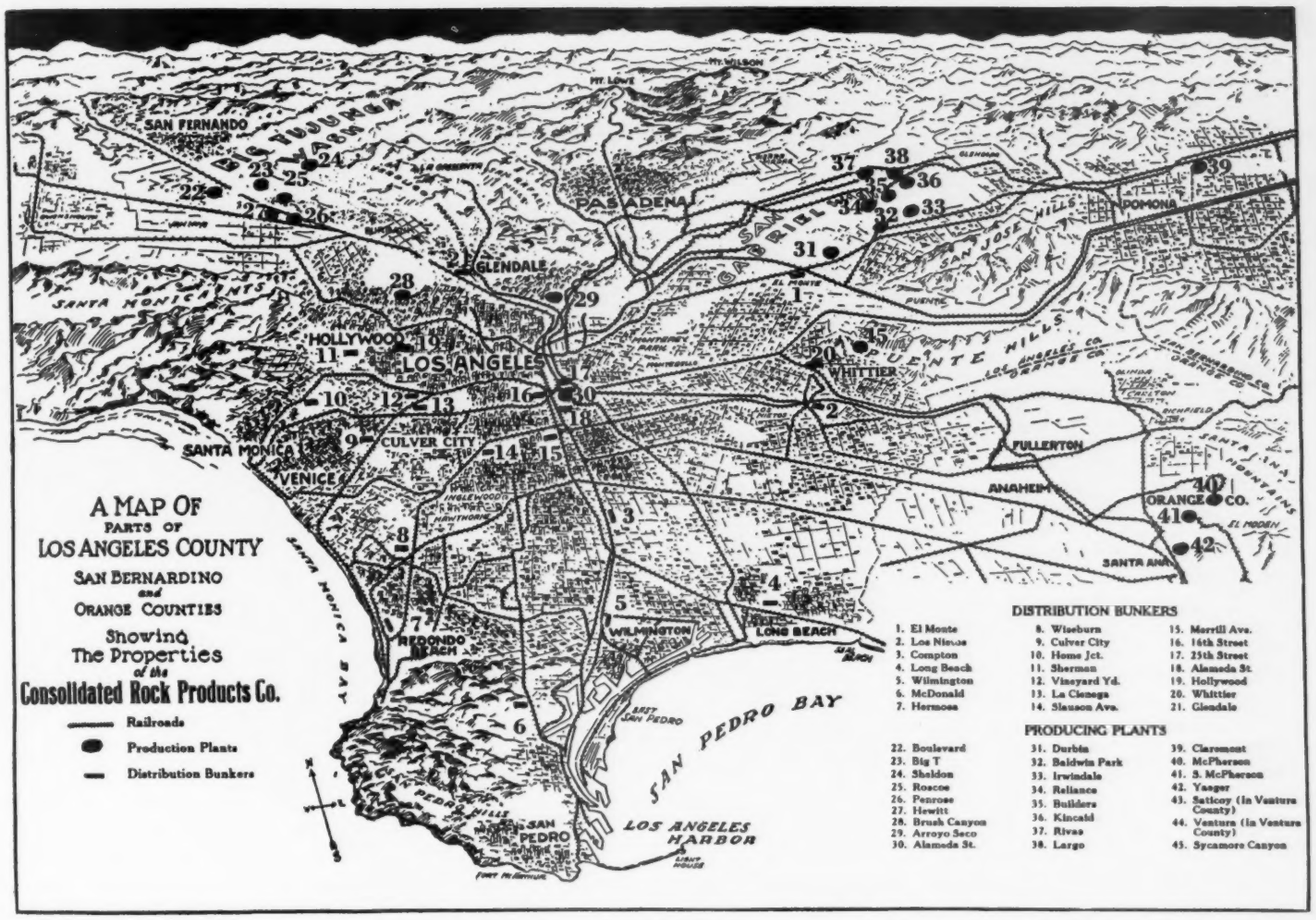
Cement and Aggregate for Big Dam

However, work is soon to begin on the San Gabriel dam and that will take more cement than one plant of ordinary size can supply in a year. Los Angeles county is to buy the cement and it called for bids some time ago. Only one bid was received and that was from the four plants in the southern part of the state. They filed a statement with it saying that all four must participate in order to supply the cement in the required time. The bid was rejected and new specifications were drawn which have not yet been published.

The job will contain 3,800,000 cu. yd. of concrete and will take about 3,200,000 bbl. of cement, for it has been found that the specified required strength (2500 lb. per sq. in.) can be obtained with something between 0.8 bbl. to 0.9 bbl. per cu. yd. The reason is found in the grading of the aggregate and the fact that the maximum sized pieces are 8 in. in diameter. The use of such large pieces required careful testing to make sure that



The Orange County plant of the Union Rock Co. is also included in the new company



Map of Los Angeles, San Bernardino and Orange counties, showing properties of the new Consolidated Rock Products Co.

the concrete would stand the expected stress and test pieces 18 in. in diameter and 36 in. long were cast in slide lock molds and then broken at the State University's laboratory in Berkeley. Determinations had to be made taking into account the effect of the size of the test cylinder and the effect of removing successively the larger sizes in the aggregate. The best fineness modulus to use with each maximum size tested had also to be determined. The work seems to have been very thoroughly and carefully done and the saving of perhaps 20% of the cement that would ordinarily have been used certainly justified all the time and expense that was put upon it. It is a good illustration of the newer method of designing concrete mixes, explained by F. H. Jackson in a paper published in *Public Roads*. As he showed, we may not get any better concrete by the use of such methods, but we will get as good concrete for less money.

Aviation is booming on the West Coast and several large airports are being constructed. Whatever its final effect on the rock products industry (and some pessimists are already predicting that it will seriously affect highway and railroad construction) the immediate effect is to increase the amount of cement and aggregate that is being used. The biggest concrete jobs now going on here are airport jobs.

Edwin P. Lucas Named President of Superior Portland

A PROTEGE of John C. Eden—Edwin P. Lucas of Bellingham—on February 11th stepped into the presidency of the Superior Portland Cement, Inc., to fill the vacancy left by the recent death of Mr. Eden.

Mr. Lucas, whose comparative youth is supported by extensive experience in large industrial developments in the Pacific Northwest, was advanced to the presidency of the corporation at the annual meeting when also two new vice-presidents and two new directors were elected.

As vice-president of the cement company, Mr. Lucas in the past two years has shouldered much of the responsibility for managing Mr. Eden's interests and has taken an active part in administering the Superior company's affairs. The past twelve months have given the company its most notable period. It is now rated as an $8,000,000 institution with a daily capacity of 6000 bbl.

The two new vice-presidents are George E. Dickinson, who is also secretary, and C. L. Wagner, who becomes vice-president in charge of operations. The additional directors elected today are H. A. Reid, junior partner of Bond, Goodwin and Tucker, Inc., of San Francisco, and Gordon Tongue, who also is treasurer.

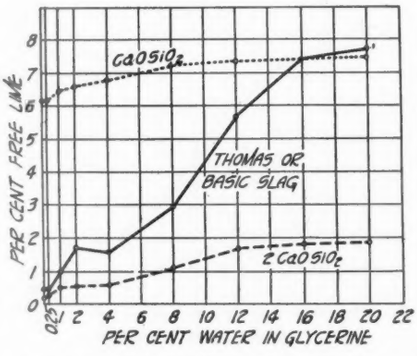
Officers reelected at the meeting were: C. N. Reitze, vice-president and general manager; Mr. Dickinson, secretary, and Mr. Tongue, treasurer.

Edwin P. Lucas

Foreign Abstracts and Patent Review

Investigations Concerning the Chemical Reaction Between Trass and Lime. Dr. A. Steopoe, Bukarest, presents his results in tables and diagrams or determining those quantities of the constituents of four German trasses, which are disintegrated by lime and enter into reaction with it, and that under the same conditions that these reactions take place in a normal hardening of trass mortar. After certain periods of combined storage in damp air and water, those constituents of the trass samples, which had entered into reaction with lime, were determined, analytically, the principle of determination being based upon the fact that the silicic acid, when liberated from its combinations, has a great tendency to remain in colloidal condition, especially when working with easily decomposed silicates—as cement or as combinations derived from colloidal silicic acid and lime—and when the reaction is made in the cold instead of in the hot and a hydrochloric acid of 1.12 density is used for disintegrating the silicates. Florentin's method (*Chimie et Industrie*,, **17**, pp. 996-98) for the determination of cement in mortar and concrete was found to be exact and scientifically accurate, according to which 1 gram of powdered mortar is weighed in a "boat" and gradually added (during three minutes) to 60 cu. cm. of cold hydrochloric acid of 1.12 density, which was in a 250-cu. cm. cup cooled with water; after a pause of 10 minutes the solution was filtered over a 12-cm. filter moistened with a few drops of hydrochloric acid, and thoroughly washed with hot water; in the filtered liquid the silicic acid and the trioxide was determined in customary manner. Steopoe based the values given in his tables upon the dried trass material; and the percentage of these proportions was calculated from the chemical composition of the trass and the mortar. Thus, Steopoe first determined the loss on drying and the content of silicic acid and trioxide of the samples of trass, dried the mortar considerably upon a blast and placed it for the night in hydrochloric acid 1.12, after which the easily soluble constituents were determined by Florentin's method.—*Tonindustrie-Zeitung* (1928), 52, 80, pp. 1609-12.

The Determination of Free Lime. H. Rathke, Breslau, describes the glycerine ammonium acetate method of Emley (*Transactions* of the American Ceramic Society, 17 (1915), 720), the improvement of this process by use of another titration substance and investigations concerning the degree of error brought about by percentages of water in glycerine, in respect to the determination of the presence of calcium oxide, usually designated as "free lime" in cements and other products in which it is undesirable. After considerable investigation one method of determination was found usable, in which the free lime is changed over into calcium glycerate by treatment with glycerine, and this titrated with alcoholic ammonium acetate with phenol phthalein as indicator, designated as the Emley method. This calcium oxide is only a smaller or greater portion of the total content of this chemical, and the remainder may be present in combination with aciduous substances or in fixed solution, in both which instances there is no reaction with glycerine as determined by Diepschlag and Fliegenschmidt, for the latter instance. The combined or bound lime is usually present in the form of silicates, aluminas and among slags in the form of phosphates; these are in part


CaOSiO2
THOMAS OR BASIC SLAG
2CaOSiO2
PER CENT FREE LIME
PER CENT WATER IN GLYCERINE
0 1 2 3 4 5 6 7 8
0.25 1 2 4 6 8 10 12 14 16 18 20 22

Graph showing how the quantity of free lime increases with the increase of the percentage of water in the glycerine

considerably dissolved by water and the lime enters as $Ca(OH)_2$ into solution and is thus also determined by the Emley method, when water is present, so that the error occurring depends on the quantity of water available, its period of influence upon the lime combination and the ability of the latter to dissolve in water. Hence there should be no water in the glycerine and the latter should be thinned with non-acquaeous alcohol. In 1882, A. Destrem found in tests that calcium glycerate is changed by water again into calcium oxide and glycerine, so that to avoid reversion of the reaction the concentration of water should be zero or as low as possible, which, being impossible, there should be a considerably large concentration of glycerine. The process of dissolving in glycerine slows down by lumping of large quantities of calcium oxide, so that the testing material should be added in small quantities, and since the glycerine is very hygroscopic and easily absorbs moisture from the air to several per cent of its weight in a few hours, the testing apparatus should be tightly closed. There are several disadvantages in titrating with ammonium acetate, in that the solution must be titrated at boiling heat, in that the test may take an hour for determination, and in that the boiling of the finely powdered substance in the alcohol-glycerine solution is inconvenient due to bubbling.

Therefore the titration medium, alcoholic ammonium acetate, usable only under boiling, was discarded in favor of a 1/10 n. solution of pure crystallized tartaric acid, with which the calcium glycerate can be titrated cold, and phenol phthalein again used as an indicator. Tartaric acid dissolved in alcohol does not esterify and keeps an unlimited time. Calcium tartrate and glycerine are formed from calcium glycerate and tartaric acid and no ammonia is produced in the reaction, so that none need be boiled off and therefore the solution can be titrated cold. The calcium tartrate formed is insoluble in alcohol-glycerine solution and secretes a fine white precipitate without impairing the determination of the conclusion of titration by the disappearance of the red coloring caused by the phenol phthalein. The titration solution was prepared by dissolving about 7.5 g. of pure crystallized tartaric acid in one liter of absolute alcohol and one titer standardized empirically by titrating a known quantity of pure calcium oxide, the calcium oxide being obtained by drying calcium carbonate of Merck to a stanstant weight. The glycerine was distilled several times and the specific weight retested with the Pyknometer. The calcium oxide was weighed in quantities of 0.02 to 0.1 g. into an Erlenmeyer flask, mixed with 10 to 20 c. cm. of glycerine, and the flask tightly closed with a rubber stopper and placed upon a moderately heated sand bath. After about 24 hours everything was dissolved, the solution thinned with alcohol and after addition of a few drops of a solution of 0.2 g. phenol phthalein titrated cold in 100 c. cm. of absolute alcohol. The average value of the titer (CaO in g. corresponding to 1 c. cm. solution) is 0.00472, derived from variations between 0.00471 to 0.00473 in five tests. The cheaper absolute methyl alcohol may be used in place of absolute ethyl alcohol, but its vapors are harmful to health. A burette with pinch cock is recommended in place of greased glass cocks, which stick or become leaky by use of alcoholic solutions.

Further tests were made to determine the degree of error in the presence of different percentages of water during titration; for in the formation of calcium glycerate 1 mole of water forms per 1 mole of CaO, making 0.030 gram of water per 0.1 gram of CaO entering into solution. Mixing the 0.1 gram CaO in 10 c. cm. of glycerine of 1.266 specific weight, there will be 12.7 grams of solution containing 0.23% of water. Tests

were made with synthetic $2CaO \cdot SiO_2$ and with synthetic $CaO \cdot SiO_2$ and also with Thomas or basic slag, the finely powdered substances being placed in 0.5 gram quantities with 10 c. cm. glycerine and increasing percentages of water in Erlenmeyer flasks, which were closed with rubber stops and set aside for 24 hours, after which the 45 samples were each thinned with 50 c. cm. absolute methyl alcohol and titrated with tartaric acid, the basic slag solutions being first filtered and the filter washed with alcohol glycerine solutions to remove the dark colored precipitate, which makes recognition of the termination of titration impossible. The results are plotted in Fig. 1. Accordingly, the quantity of free lime found increases with an increase in percentage of water in the glycerine. At 0.25% water content the error caused by the water content is still within the range of the test error for $CaO \cdot SiO_2$ and $2CaO \cdot SiO_2$, whereas for basic slag the free lime content has increased from 0.11 to 0.32%. The titration of basic slag at higher percentages of water becomes increasingly difficult, due to a light brown coloring of the solution, which coloring becomes increasingly intensive, as more water is present in the glycerine solution. In the 24-hour tests the water was given a chance to saturate itself with $Ca(OH)_2$, but in practice the testing of a material for free lime takes but a few minutes and the error, due to the influence of water percentages, will be considerably less. The less lime dissolved, the less will be the water content and the less is the error. At higher free lime contents and with materials more easily soluble in water, the quantity of free lime will be found to be greater than actual.

In testing a commercial cement for free lime, 0.5 gram were mixed with 10 c. cm. of glycerine, and heated above a Bunsen burner, while shaking constantly, until the white vapors from the glycerine appeared, then thinned with 50 c. cm. of alcohol, and then titrated with the tartaric acid solution after addition of a few drops of phenol phthalein. The determination was thus done in a few minutes. In the three test series on this commercial cement the dependence of the quantity of free lime upon the water content of the glycerine was as follows:

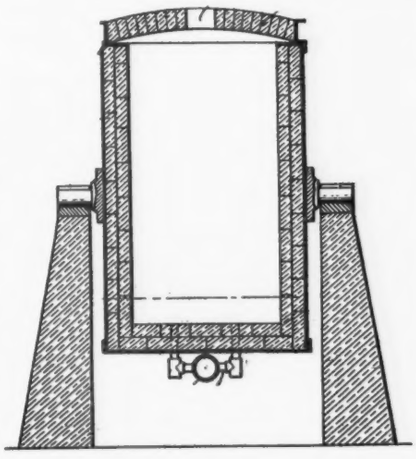
% Water in glycerine	% Free lime in test series I, II, III		
0	0	0	0
0.25	0	0.05	0.03
1	0.14	0.19	0.17
3	0.71	0.66	0.69
5	0.85	0.85	0.85
10	1.20	1.21	1.20
50	2.46	2.54	2.50

According to the determination with water-free glycerine, there is no free lime, but with higher percentages of water the decomposition of lime increases considerably. The use of alcoholic tartaric acid solution in place of ammonium acetate solution in the titration of free lime is thus a considerable improvement upon the method of Emley.—*Tonindustrie-Zeitung* (1928), **52**, 16, pp. 1318-1321.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Process of Making Periclase. The production of periclase from magnesia in the electric furnace has the disadvantage that impurities are introduced from the carbon electrodes and from the lining of the fusion chamber, and further, the periclase produced is of a coarse crystalline structure which makes the material difficult to grind without further contamination from the grinding operation by introduction of metallic iron, etc. The electric furnace product, it is claimed, also is very hydroscopic, absorbing up to as high as 10% moisture on standing, which



Converter used in burning magnesia

cakes the material and makes it unsatisfactory for electrical insulation purposes.

The author of this patent uses magnesium carbonate of as high a degree of purity as is commercially obtainable and after washing, calcines it to form MgO, after which any off-colored material is removed by hand sorting. The clinker is then ground to about 20-mesh and subjected to a second sorting by hand to remove any specks of iron oxide, etc. The crushed magnesia is aggregated into lumps by puddling with water and formed into cakes of convenient size, which are air dried. The cakes, when dry, are broken up to 2- to 3-in. size and are placed in a converter designed somewhat similarly to that used in the steel industry. The converter is supplied with gas and air through suitable pipes, and when the charge is in place the gas is ignited, after which air is admitted in such quantities as to produce an explosive mixture and surface combustion. This method of burning gas results in a much higher temperature than when gas is burned in the open. The heat is continued for 10 to 20 hours, after which the gas is shut off and the charge blown with air from two to eight hours longer.

If the first operation is stopped before the second, or air-blown, stage is completed, the charge will be off-color, due to carbon impurities. Blowing by air oxidizes the carbon and results in the charge being raised to a still higher temperature.

It is stated that by using gas having a 1150-B.t.u. value, the proportion of gas to air should be maintained at approximately 1 to 10 and a temperature of 3500 deg. F. obtained. Magnesia melts at 5070 deg. F.

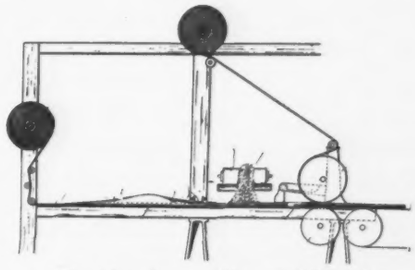
The prolonged heating under the conditions described, according to this patent, produces a periclase of small crystalline structure and of high purity, and this material will absorb practically no water (less than .02%) owing to a thin film of glassy magnesium silicate that surrounds the periclase particles. *Thomas S. Curtis, assignor to Pacific-Southwest Trust and Savings Bank*, U. S. Patent No. 1,690,771.

Process of Making Arsenate of Lime. The object of the invention is to eliminate the costly method of preparing arsenate of lime by the precipitation process where large volumes of solutions have to be handled.

In this process ordinary quick lime, hydrate lime or mixtures of both may be ground in a ball mill, either dry or with a small amount of water, until the desired reaction has taken place after which additional lime can be added to take up any remaining water and this product ground to a pulverant form. *Carleton Ellis and Vernon T. Stewart, Assignors to Chadeloid Chemical Co.*, U. S. Patent No. 1,690,627.

Apparatus for Making Plaster Board. This patent relates to a method of making plaster board of tongue-and-groove construction and provides a suitable mechanical means for forming the tongues and grooves on opposite edges and also for maintaining the plastic and paper intact though the various forming and pressing rolls.

The edges of the bottom cover sheet are first bent up and then are formed into the desired tongue-and-groove shape before the application of the plastic mass, and while



Machine for making wallboard

the bottom sheet is moving up toward the board forming roller and passing beneath it, it is necessary to support or maintain the formed edges of the bottom cover sheet in order that they are not forced out by the plastic mass when the pressure of the roller is applied. This apparatus and the method employed constitutes the novel subject matter in the present application. *Harry E. Brooksby and Carl Absmeier, assignors to U. S. Gypsum Co.*, U. S. Pat. No. 1,689,322.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Jan. 26	Limestone Flux Week ended Feb. 2	Sand, Stone and Gravel Week ended Jan. 26	Sand, Stone and Gravel Week ended Feb. 2
Eastern	2,242	2,078	1,713	1,529
Allegheny	2,600	2,644	1,949	1,718
Pocahontas	122	147	322	306
Southern	388	493	6,765	6,278
Northwestern	382	490	481	539
Central Western	428	446	5,114	4,479
Southwestern	298	402	4,548	4.577
Total	6,460	6,700	20,892	19,426

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

District	Limestone Flux 1928 Period to date Feb. 4	Limestone Flux 1929 Period to date Feb. 2	Sand, Stone and Gravel 1928 Period to date Feb. 4	Sand, Stone and Gravel 1929 Period to date Feb. 2
Eastern	8,374	10,176	8,580	8,252
Allegheny	13,019	12,979	9,165	8,998
Pocahontas	1,060	547	1,747	1,488
Southern	2,480	2,184	41,670	31,781
Northwestern	2,673	2,325	5,815	2,850
Central Western	1,870	2,107	24,262	23,515
Southwestern	2,054	1,859	20,041	21,604
Total	31,530	32,177	111,280	98,488

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	1929
Limestone flux	***31,530***	***32,177***
Sand, stone, gravel	***111,280***	***98,488***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning February 23:

SOUTHERN FREIGHT ASSOCIATION DOCKET

44125. Addition of calcium **carbonate and crushed or ground limestone** to the list of transit ingredients in manufacture of mixed feed, as shown in Agent Speiden's I. C. C. 1199. It is proposed to add calcium carbonate and crushed or ground limestone to Item 15B of Agent Speiden's Tariff 170A, I. C. C. 1199.

44162. **Molding sand,** from New Albany, Ind., to Prattville, Ala. It is proposed to establish reduced rate of 293c per net ton on: Molding sand, carloads, as described in Agt. Speiden's I.C.C. 1202, from New Albany, Ind., to Prattville, Ala., same as the rate in effect to Montgomery, Ala.

44196. **Chert,** from Cumnock, N. C., to interstate points in southern territory. Common sand rates now apply. It is proposed to establish rates on: Chert, carloads, minimum weight 100,000 lb. (when 90% of marked capacity of car is less than 10,000 lb. such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity, the actual weight will govern, from Cumnock, N. C., to interstate points in southern territory, on basis of scale prescribed by the Interstate Commerce Commission in Docket 17517 for application over short and/or weak lines.

44248. **Stone or slate,** from Fairmount, Ga., and Tellico Plains, Tenn., to Marseilles, Ill. It is proposed to establish the following reduced rates on stone or slate, crushed, carloads, minimum weight 6,000 lb., to Marseilles, Ill., from Fairmount, Ga., 423c; from Tellico Plains, Tenn,, 405c per net ton. Same as rate to Chicago, Ill., and points taking same rates.

WESTERN TRUNK LINE DOCKET

2051-I-I. **Stone, crushed** (See Note 2), but not less than 50,000 lb., from Sioux Falls, S. D., and Luverne, Minn., to Aurora, Neb. Present, 15½c per 100 lb.; proposed, 14½c per 100 lb.

6799. **Rock, gypsum,** carloads, from Humboldt and Mason City, Iowa, to stations in Minnesota on the C. M. St. P. & P. R. R. and M. & St. L. R. R. Present—See "Proposed." Proposed—To restrict rates on **broken, crushed or ground stone,** carloads, published in W. T. L. Tariff 13P, Item 2160, so as not to apply on gypsum rock.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

SOUTHWESTERN FREIGHT BUREAU DOCKET

16875. **Crushed stone,** from points in Missouri to Memphis, Tenn. To establish the following rates in cents per 100 lb. on stone, crushed (broken stone in sizes up to 100 lb. weight), carloads, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb., marked capacity of car will govern, from points in Missouri shown below, to Memphis, Tenn.:

To—	Rates	To—	Rates
Irondale	10	Annapolis	9
Bismarck	10	Leadonna	9
Iron Mountain	9½	Vulcan	9
Middlebrook	9½	Des Arc	9
Lopez	9½	Gads Hill	9
Pilot Knob	9½	Platow	9
Ironton	9½	Piedmont	9
Arcadia	9½	Carters	9
Hogan	9½	Clearwater	9
Glover	9½	Leper	9
Chloride	9½	Mill Spring	9
Sabula	9½	Granite Bend	9

Shipper states that he is unable to continue movement of traffic on basis of the present rates, especially in view of adjustments made from competitive points east of the Mississippi river.

CENTRAL FREIGHT ASSOCIATION DOCKET

20748. To establish on **lake and beach sand,** carloads, Ludington and Manistee, Mich., to Vassar, Mich., rate of 126c per net ton, same to apply via Pere Marquette Ry. direct. Present rate—Under application of the intermediate clause the Port Huron rate of $1.39 is applicable per Pere Marquette Ry. Tariff 5694-G.

20753. To establish on **crushed stone and stone screenings,** in bulk, in open cars, carloads, Kenneth, Ind., to destinations shown below, following rates, in cents per net ton:

To	Pres.	Prop.
La Paz, Ind.	101	138
Teegarden, Ind.	101	138
Walkerton, Ind.	101	138
Union Center, Ind.	101	138
Wellsboro, Ind.	105	138
Alida, Ind.	105	138
Coburg, Ind.	110	161
Suman, Ind.	110	161
Woodville, Ind.	110	**161**
McCool, Ind.	110	161
Willow Creek, Ind.	110	161
Miller, Ind.	110	161

20755. To establish on **crushed stone,** carloads, White Sulphur, O. (via C. C. C. & St. L., Columbus, O.; N. Y. C. R. R., Athens, O., and B. & O. R. R.), to destinations shown below, following rates, in cents per net ton (present rates, sixth class):

To	Prop.	To	Prop.
Mineral, O.	125	Cooiville, O.	125
Canaanville, O.	115	Torch Hill, O.	125
Guysville, O.	125	Little Hocking, O.	125
Stewart, O.	125	Porterfield, O.	125
Beebe, O.	125	Rockland, O.	135
Frosts, O.	125	Belpre, O.	135

20756. To publish on **sand** (all kinds) and **gravel,** carloads, Barr, O., to Philo, O., rate of 95c per ton of 2000 lb. Present rate, 140c per ton of 2000 lb.

20762. To establish on **stone, breakwater and rip rap,** carloads, Amherst, O., to Austintown and Mineral Lodge, O., via N. Y. C. R. R., Cleveland, O., and Erie R. R., 115c per net ton. Present rates, 139c per net ton.

20761. To establish on **stone, crushed,** in bulk only; **crushed stone screenings,** in bulk only; **limestone, agricultural** (not ground or pulverized), in bulk only, in open-top cars only; **stone tailings,** carloads, Narlo, Maple Grove, Woodville and Gibsonburg, O., to destinations shown below, following rates, in cents per net ton:

To	From Marblehead, O.* Pres.	Prop.
Addison Junction, Mich.	117	117
Adrian, Mich.	110	110
Albion, Mich.	125	125
Alegan, Mich.	155	155
Alma, Mich.	145	145
Ann Arbor, Mich.	175	115
Battle Creek, Mich.	135	135
Benton Harbor, Mich.	175	165
Casnovia, Mich.	.....	175
Cassopolis, Mich.	155	155
Cedar Springs, Mich.	165	165
Dowagiac, Mich.	155	155
Durand, Mich.	130	130
Eaton Rapids, Mich.	130	130
Edwardsburg, Mich.	155	155
Grand Haven, Mich.	185	185
Grand Ledge, Mich.	155	145
Grand Rapids, Mich.	155	155
Greenville, Mich.	165	165
Hanover, Mich.	117	117
Hastings, Mich.	145	145
Hillsdale, Mich.	115	115
Holly, Mich.	130	130
Holland, Mich.	175	165
Howard City, Mich.	165	165
Homer, Mich.	125	125
Ionia, Mich.	155	155
Jackson, Mich.	117	117
Kalamazoo, Mich.	145	145
Lansing, Mich.	135	135
La Peer, Mich.	135	135
Manchester, Mich.	107	107
Marshall, Mich.	130	130
Mt. Pleasant, Mich.	.....	155
Muskegon, Mich.	185	185
Niles, Mich.	155	155
Owosso, Mich.	135	135
Plainwell, Mich.	155	155
Pontiac, Mich.	130	117
Rochester, Mich.	135	130
Schoolcraft, Mich.	145	145
South Haven, Mich.	.....	165
Sturgis, Mich.	135	135
Tecumseh, Mich.	102	102
Three Rivers, Mich.	145	145
Vicksburg, Mich.	145	145
Ypsilanti, Mich.	139	115

*For information only.

20787. To establish on **sand, viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica,** carloads, from points located on the W. & L. E. Ry. properly embraced in the Canton, Sandusky and Zanesville groups to destinations shown below, following rates. Rates in cents per ton of 2000 lb.:

To—	From Sandusky Group Pres. Rate	Pro. Rate
Ludington, Mich.	344	304
Baldwin, Mich.	344	304
White Cloud, Mich.	344	304
Reed City, Mich.	344	304
Big Rapids, Mich.	344	304
Howard City, Mich.	344	304
Edmore, Mich.	344	304
Farwell, Mich.	324	304
Clare, Mich.	324	304
Mt. Pleasant, Mich.	324	304
Coleman, Mich.	324	304
Midland, Mich.	324	304

To—	From Canton and Zanesville Groups Pres. Rate	Pro. Rate
Ludington, Mich.	382	342
Baldwin, Mich.	382	342
White Cloud, Mich.	382	342
Reed City, Mich.	382	342
Big Rapids, Mich.	382	342
Howard City, Mich.	382	342
Edmore, Mich.	382	342
Farwell, Mich.	362	342
Clare, Mich.	362	342
Mt. Pleasant, Mich.	362	342
Coleman, Mich.	362	342
Midland, Mich.	362	342

20814. To establish on **stone, crushed,** in bulk only; **crushed stone screenings,** in bulk only carloads; **limestone, agricultural** (not ground or pulverized), in bulk, in open-top cars only, carloads; stone tailings, carloads, Narlo, O., to N. Y. C. R. R. stations shown below, following rates:

(In cents per net ton)

To— N. Y. C. R. R. Stations.	Pres. Rate	Prop. Rate
Ray, Ind.	SC	135
Angola, Ind.	IL	130
Pleasant Lake, Ind.	XA	130
Waterloo, Ind.	TS	130
Goshen, Ind.	HS	145
Middlebury, Ind.	.....	150
Shipshewanna, Ind.	.....	150
Elkhart, Ind.	C	145
Bristol, Ind.	SC	145
South Bend, Ind.	IL	150
New Castle, Ind.	XA	155
North Judson, Ind.	TS	150
Hamlet, Ind.	HS	150
Walkerton, Ind.	.....	150
North Liberty, Ind.	.....	150

20822. To establish on **crushed stone,** carloads, Holland, O., to Gerald, Naomi and Ottokee, O., rate of 70c per net ton. Present rates—90c per net ton to Gerald and Naomi, O., and 80c per net ton to Ottokee, O.

TRUNK LINE ASSOCIATION DOCKET

20228. **Gravel and sand,** N. O. I. B. N. in open cars, except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Whitney Point, N. Y., to Vestal, N. Y., 75c per net ton. Reason—The proposed rate is the same as now in effect from New Milford, Penn., to Vestal, N. Y.

20230. **Limestone, ground or pulverized,** and **limestone dust,** carloads, minimum weight 50,000 lb., from Jamesville, N. Y., to Lanesboro, $1.83, and Ararat to Carbondale, Penn., inclusive, $2.09 per net ton, via D. L. & W. and Erie R. R. Reason—The proposed rates are the same as now in force from and to the same points via the D. & H. Co.

20241. **Sand,** carloads (See Note 2), from Hancock, Round Top and Tonoloway, Md., to New England points taking Portland basis and Boston basis, $4.30 per net ton, and Rockland basis, $4.90 per net ton. Reason—The proposed rates are comparable with rates from the Mapleton district to New England points.

20244. **Ground limestone,** carloads, minimum weight 50,000 lb. (Group rates in cents per 100 lb.)

To Stations	From Stations †Cavetown-Pinesburg Proposed	*Thomasville Bittinger Proposed
Franklin, W. Va. to Shaw, W. Va.	10	10
Chaffee, W. Va. to Thomas, W. Va.	11	11
Coke Siding, W. Va. to Davis, W. Va.	12	12

†Points subject to Group "B," W. M. I. C. C. 7770.

*Points subject to Group "A," W. M. I. C. C. 7770.

Reason—The proposed rates are fairly comparable with rates now in force to Grafton, Clarksburg and West Union, W. Va.

20250. **Crushed stone, carloads** (See Note 2), from Bound Brook, N. J., to Chester and Bartley, N. J., 80c per net ton. Reason—Proposed rate is fairly comparable with rates on like commodities for like distances, services and conditions.

20256. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Lewes, Del., to Farnhurst, New Castle, Corbit and Glasgow, Del., $1.25 per net ton. Reason—The proposed rate is fairly comparable with rates now in force to Bear, Del., Queen Anne and Morton, Md.

20267. **Gravel,** carloads (See Note 2), from Staffordsville, N. J., to Beach Haven, N. J., 50c per net ton. Reason—The proposed rate is fairly comparable with rates to Ship Bottom, Beach Arlington and Brandt Beach, N. J.

20268. **Crushed stone,** carloads (See Note 2), from Rock Hill, Penn., to Bridgeton, N. J., $2.05 per net ton. Reason—The proposed rate is comparable with rates now in force from Hendricks, Green Lane, Hillsboro and Trap Rock, Penn.

20273. **Crushed stone,** carloads (See Note 2), from Bethlehem, Penn., to Pittstown, N. J., $1 per net ton. Reason—The proposed rate is fairly comparable with rate from Allentown, Penn., to Pittstown, N. J.

20274. **Crushed stone,** carloads (See Note 2), from Morrisville and Tullytown, Penn., to Red Bank and Little River, N. J., 90c per net ton. Reason—The proposed rate is comparable with rates on like commodities from and to points in the same general territory.

20275. **Crushed stone,** carloads (See Note 2), from Steelton, Penn., to Herndon, Penn., 95c; Selinsgrove, Penn., 115c; Sunbury, Penn., 115c; Montandon, Penn., 125c; Williamsport, Penn., 150c; South Danville, Penn., 115c; East Bloomsburg, Penn., 140c; Keefer, Penn., 125c; Shamokin, Penn., 125c; Mt. Carmel, Penn., 140c. Rates in cents per net ton. Reason—The proposed rates are fairly comparable with rates from Honey Creek, Naginey and Shraders, Penn., to the same destinations.

20287. **Crushed stone,** carloads (See Note 2), from Port Deposit, Md., to Lenola, N. J., $1.25 per 2000 lb. Reason—Proposed rate is fairly comparable with rates now in force to Maple Shade, Haddonfield and Woodbury, N. J.

20288. **Sand,** carloads (See Note 2), from Menantico, N. J., to Woodstown, N. J., 81c per net ton. Rate to expire July 31, 1929. Reason—To meet motor truck competition.

20289. To increase rate of 7½c to 8c per 100 lb. on **agricultural, land, chemical, gas or glass lime,** carloads, minimum weight 30,000 lb.; also **ground limestone,** carloads, minimum weight 50,000 lb., from Bainbridge, Penn., to Lykens, Short Mountain and Williamstown, Penn. Reason—To correct tariff error and place rate on proper basis.

20297. **Sand** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2). To Woodstown, N. J., from Morrisville, Penn., 90c; Paulsboro, N. J., 75c; Masonville to South Pemberton, N. J., 90c. Rates in cents per 2000 lb. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

20301. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), from Oaks Corners, N. Y., to Tompkins and Nelson, Penn., $1.10 per net ton. Reason—Proposed rates are fairly comparable with rates on like commodities from and to points in the same general territory.

20312. **Sand** (other than blast, engine, foundry, glass, molding and silica) and **gravel,** carloads (See Note 2), to stations on L. V. R. R., from Wysox and Towanda, Penn., to:

Standing Stone, Penn.	70
Rummerfield, Penn.	70
Hornets Ferry, Penn.	70
Ulster, Penn.	70
Milan, Penn.	70
Wyalusing, Penn.	75
Athens, Penn.	75
Sayre, Penn.	75
Waverly, N. Y.	75

Rates in cents per net ton. Reason—Proposed rates are comparable with rates now in force from Sayre, Germans, Noxen and Wyoanna, Penn.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

16216. **Stone, broken or crushed, in bulk,** in gondolas or other open top cars, carloads (See Note 3), to Plymouth, Mass., from Branford (Pine Orchard Quarry) and East Wallingford (Reed's Gap Quarry), Conn., $1.25 per net ton, and from Westfield, Mass., $1.25 per net ton. Reason—To provide rate that will compete with water borne stone.

16219. **Sand, blasting, core, fire and sea** (See Note 2), from Fox Point, R. I., to Brooklyn Contract Terminals, N. Y., 17c. Reason—To provide rate same as that approved from Davisville, R. I.

I. C. C. Decisions

42575. Sand, gravel and crushed stone rate adjustment approved. The General Committee recently approved the establishment of reduced rates, based on Docket 17517, on chert, sand, gravel, crushed stone, slag, rubble stone and broken stone, in straight or mixed carloads, (see note 3) from Alco, Eagle Mountain, Indian Rock, Klotz, Longcor, Longdale, Miles, Pembroke, Ripplemead, Rocky Point and Rostico, Virginia, to Southern Railway stations in Virginia, North Carolina and South Carolina south of Lynchburg, Richmond and Norfolk and east of line drawn from Newton, N. C., to Columbia, S. C.

Effect of Heat Treatment on Diatomaceous Earth

A RECENT paper presented by Hobart M. Kraner at the meeting of the American Ceramic Society, Atlantic City, N. J., February, 1928, shows that the change in structure due to high heat treatment of diatomaceous material is more dependent upon the composition and amount of the impurities present than upon the structure of the diatom, and when air-floated samples of diatomaceous earth, which were quite pure, were heated the samples showed very little deterioration up to 1300 deg. C. (2372 deg. F.).

As the refractoriness of a diatom material is indicated by the cone fusion test and is used as a criterion of the insulating range, a microscopic study was made of several samples showing the changes before deformation took place, and it was apparent that the diatom structure of these earths could be destroyed without any indication of deformation of the diatomaceous earth.

There did appear, however, a direct relation between purity and retention of diatom structure at the increasing higher temperatures, as the purer samples were hardly affected. The better grades of earths showed in the photomicrographs that they were capable of holding their diatom structure up to 1260 deg. C. (2300 deg. F.), but at 1300 deg. C. (2372 deg. F.) either lost their structure entirely or partially sintered, the degree depending on the amount and kind of impurities present.

"Bubblestone" Trademark Application Upheld

THE application of the Bubblestone company to register the word "Bubblestone" as its trademark has been sustained in Washington, in spite of the protests of one of the large gypsum companies which opposed the registration. The applicant intends to use the trademark on a building material having a more or less porous and bubble-like construction. The opposing company sought to show that the proposed trademark was a word descriptive of all sorts of building materials having a bubble-like structure and not merely descriptive of the Bubblestone company's product. It further indicated that this type of building material was known under that name before the applicant started the manufacture of its product. The application, was permitted on the testimony of the Bubblestone company sustaining its position.

Portland Cement Production in January

Production Is 0.1% Greater Than January, 1928, But Shipments Show Decrease of 12.3%

THE PORTLAND CEMENT INDUSTRY in January, 1929, produced 9,781,000 bbl., shipped 5,735,000 bbl. from the mills, and had in stock at the end of the month 26,696,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in January, 1929, showed an increase of 0.1% and shipments a decrease of 12.3% as compared with January, 1928. Portland cement stocks at the mills were 6.3% higher than a year ago.

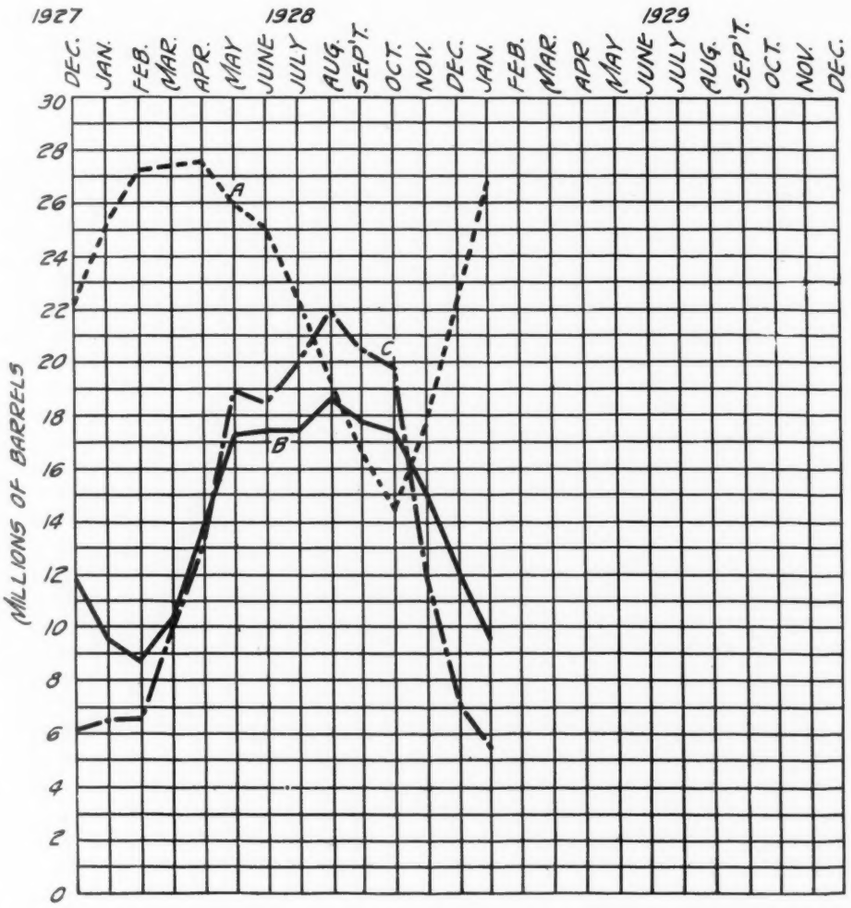
The output of another new plant, located in Washington, is included in the statistics here presented, which are compiled from reports for January from all manufacturing plants except four for which estimates have been included in lieu of actual returns.

Statistics of 160 Plants

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 160 plants at the close of January, 1929, and of 155 plants at the close of January, 1928. In addition to the capacity of the new plants which began operating during the twelve months ended January 31, 1929, the estimates include increased capacity due to extensions and improvements at old plants during the period.

RELATION OF PRODUCTION TO CAPACITY

	Jan. 1929	Jan. 1928	Dec. 1928	Nov. 1928	Oct. 1928
	Pct.	Pct.	Pct.	Pct.	Pct.
The month	46.5	49.4	60.4	77.4	87.1
12 months ended	71.0	74.5	74.0	74.1	73.8


1927
1928
1929
DEC. JAN. FEB. (MAR. APR. (MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC. JAN. FEB. MAR. APR MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC.
(MILLIONS OF BARRELS)
30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
A
B
C

(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1928 AND 1929

Month	1928—Production—1929		Stocks at end of month 1928	1929
January	11,839,000	11,897,000	9,672,000	9,627,000
February	11,363,000	.....	12,237,000	.....
March	12,501,000	.....	14,463,000	.....
April	13,844,000	.....	15,002,000	.....
May	16,025,000	.....	14,329,000	.....
June	15,940,000	.....	12,944,000	.....
July	15,981,000	.....	11,707,000	.....
August	16,202,000	.....	9,357,000	.....
September	15,909,000	.....	7,566,000	.....
October	15,782,000	.....	5,944,000	.....
November	14,930,000	.....	5,953,000	.....
December	13,426,000	.....	*7,422,000	.....

*Revised.

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN NOVEMBER AND DECEMBER, 1927 AND 1928, IN BARRELS*

Shipped to—	1927—Nov.—	1928	1927—Dec.—	1928
Alabama	252,077	192,012	154,744	123,522
Alaska	132	264	132	132
Arizona	52,276	56,742	59,318	42,385
Arkansas	85,638	99,304	57,068	69,131
California	1,027,706	1,025,113	824,570	859,234
Colorado	74,276	52,084	26,601	24,317
Connecticut	170,103	161,388	86,509	97,419
Delaware	20,630	25,357	11,926	14,122
District of Columbia	70,727	88,507	35,714	53,681
Florida	142,655	117,845	113,291	97,857
Georgia	143,624	146,394	82,378	98,912
Hawaii	8,726	22,593	15,380	20,659
Idaho	16,447	17,765	4,441	5,533
Illinois	880,391	930,003	354,542	469,527
Indiana	289,212	258,523	95,766	133,155
Iowa	123,547	96,294	23,951	34,397
Kansas	218,395	167,928	54,211	93,623
Kentucky	114,964	146,416	54,727	63,567
Louisiana	110,968	104,808	87,776	74,396
Maine	30,019	30,175	10,808	11,944
Maryland	180,358	157,297	79,376	90,219
Massachusetts	237,558	224,846	115,909	136,456
Michigan	641,339	728,972	288,329	368,112
Minnesota	96,509	124,063	31,326	52,903
Mississippi	97,083	124,113	54,595	90,745
Missouri	305,254	364,782	122,327	193,691
Montana	14,205	25,857	7,359	11,889
Nebraska	58,307	67,962	22,265	32,472
Nevada	6,789	9,566	7,151	4,029
New Hampshire	34,719	37,083	17,676	19,477
New Jersey	672,737	690,435	334,897	383,075
New Mexico	23,695	21,301	8,557	15,068
New York	1,514,114	1,565,942	972,156	1,150,410
North Carolina	264,393	248,290	112,711	148,245
North Dakota	5,437	14,375	1,503	4,237
Ohio	675,806	707,863	265,267	351,927
Oklahoma	319,776	238,178	166,309	220,102
Oregon	80,653	65,960	51,020	39,466
Pennsylvania	932,367	958,080	482,928	539,402
Porto Rico	0	500	0	0
Rhode Island	58,352	61,403	23,034	43,188
South Carolina	133,046	135,037	76,009	92,059
South Dakota	13,870	17,271	1,570	6,722
Tennessee	174,923	257,552	96,305	138,090
Texas	506,726	447,090	320,201	379,921
Utah	30,046	29,404	13,642	15,132
Vermont	21,938	31,272	12,675	11,026
Virginia	145,820	148,508	76,722	97,175
Washington	129,611	243,351	94,981	132,183
West Virginia	104,307	94,931	42,153	46,917
Wisconsin	214,907	258,637	89,645	114,658
Wyoming	15,407	11,987	7,676	4,428
Unspecified	32,465	32,678	405	502
	11,575,030	11,884,101	6,150,532	7,321,439
Foreign countries	43,970	66,899	49,468	62,561
Total shipped from cement plants	11,619,000	11,951,000	6,200,000	7,384,000

*Includes estimated distribution of shipments from three plants each month.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JANUARY, 1928 AND 1929, AND STOCKS IN DECEMBER, 1928

District	Production 1928—Jan.—1929		Shipments 1928—Jan.—1929		Stocks at end of month 1928—Jan.—1929		Stocks at end of Dec. 1928*
Eastern Penn., N. J. and Md.	2,351,000	2,410,000	1,545,000	1,387,000	5,886,000	6,087,000	5,065,000
New York and Maine	549,000	405,000	316,000	257,000	1,761,000	1,804,000	1,656,000
Ohio, Western Penn. and W.Va.	752,000	818,000	453,000	430,000	2,903,000	3,249,000	2,861,000
Michigan	379,000	704,000	300,000	266,000	2,221,000	2,435,000	1,998,000
Wis., Ill., Ind. and Ky.	1,354,000	946,000	519,000	328,000	3,409,000	3,307,000	2,689,000
Va., Tenn., Ala., Ga. Fla., La.	1,109,000	884,000	938,000	824,000	1,851,000	1,955,000	1,895,000
Eastern Mo., Iowa, Minn., S. D.	1,107,000	1,198,000	276,000	201,000	3,527,000	3,879,000	2,882,000
Western Mo., Neb., Kan., Okla.	476,000	614,000	451,000	349,000	1,655,000	1,611,000	1,345,000
Texas	463,000	466,000	447,000	459,000	423,000	530,000	522,000
Colo., Mont. and Utah	176,000	50,000	67,000	61,000	473,000	524,000	535,000
California	939,000	1,034,000	1,111,000	1,033,000	616,000	785,000	784,000
Oregon and Washington	113,000	252,000	118,000	140,000	391,000	530,000	418,000
	9,768,000	9,781,000	6,541,000	5,735,000	25,116,000	26,696,000	22,650,000

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1928 AND 1929

Month	1928—Production—1929		1928—Shipments—1929		Stocks at end of month 1928	1929
January	9,768,000	9,781,000	6,541,000	5,735,000	25,116,000	26,696,000
February	8,797,000		6,563,000		27,349,000	
March	10,223,000		10,135,000		27,445,000	
April	13,468,000		13,307,000		27,627,000	
May	17,308,000		18,986,000		25,984,000	
June	17,497,000		18,421,000		25,029,000	
July	17,474,000		19,901,000		22,580,000	
August	18,759,000		21,970,000		19,374,000	
September	17,884,000		20,460,000		16,799,000	
October	17,533,000		19,836,000		14,579,000	
November	15,068,000		11,951,000		17,769,000	
December	12,189,000		7,384,000		*22,650,000	
	175,968,000		175,455,000			

*Revised.

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN JANUARY, 1928 AND 1929

District	1928—Production—1929		Stocks at end of month 1928	1929
Eastern Pennsylvania, New Jersey and Maryland	2,727,000	2,824,000	1,241,000	1,344,000
New York and Maine	744,000	585,000	603,000	1,080,000
Ohio, Western Pennsylvania and West Virginia	1,062,000	1,121,000	1,417,000	1,205,000
Michigan	773,000	913,000	1,157,000	876,000
Wisconsin, Illinois, Indiana and Kentucky	1,671,000	1,499,000	835,000	984,000
Virginia, Tenn., Alabama, Georgia, Florida, Louisiana	1,247,000	1,076,000	910,000	995,000
Eastern Missouri, Iowa, Minnesota, South Dakota	1,224,000	1,279,000	603,000	570,000
Western Missouri, Nebraska, Kansas and Oklahoma	629,000	715,000	396,000	511,000
Texas	418,000	456,000	141,000	145,000
Colorado, Montana and Utah	161,000	101,000	356,000	395,000
California	989,000	1,053,000	1,544,000	1,219,000
Oregon and Washington	194,000	275,000	469,000	303,000
	11,839,000	11,897,000	9,672,000	9,627,000

Exports and Imports

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN DECEMBER, 1928

Exported to—	Barrels	Value
Canada	2,811	$ 12,653
Central America	10,485	25,320
Cuba	5,713	21,565
Other West Indies and Bermuda	7,950	23,056
Mexico	6,151	18,614
South America	20,874	93,641
Other countries	9,136	55,355
	63,120	$250,204

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN DECEMBER, 1928

Imported from	District into which imported	Barrels	Value
Belgium	Galveston	9,251	$ 11,660
	Massachusetts	27,063	35,281
	New Orleans	6,973	8,358
	New York	2,497	2,699
	Philadelphia	29,459	42,254
	Porto Rico	505	1,010
	South Carolina	15,000	18,108
	Total	90,748	$119,270
Denmark	New York	9,047	$ 9,500
	Porto Rico	46,700	64,466
	Total	55,747	$ 73,966
France	Los Angeles	492	$ 1,011
	New York	2	$ 15
	Total	494	$ 1,026
Germany	Los Angeles	1,000	$ 2,443
Norway	Porto Rico	75	$ 76
	San Francisco	24,183	30,393
	Total	24,258	$ 30,469
United K'gd'm	New York	3,735	$ 6,109
	Philadelphia	10	17
	Total	3,745	$ 6,126
	Grand total	175,992	$233,300

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN DECEMBER, 1928

	Barrels	Value
Alaska	336	$ 1,014
Hawaii	21,616	46,978
Porto Rico	4,750	11,525
	26,702	$59,517

Geological Survey of Pendleton County, West Virginia

THE West Virginia Geological Survey, I. C. White, state geologist, has published as part of the County Report for 1927 the detailed geological report covering Pendleton county, West Virginia. The report is a result of the collaboration of Dr. William F. Prouty of the University of North Carolina, who made the study of the older geologic formations, with Dr. John L. Tilton and Paul H. Price, both of the survey staff.

Pendleton county is the only county in West Virginia, so far as known, in which a dike of volcanic rock was thrust through the overlying stratified beds and reached the surface. The location and description of this interesting dike is included in the report. The areas studied include vast deposits of limestone, much iron ore of low grade and deposits of sandstone and silica sand that may be of economic importance.

British Columbia Cement Co. to Reopen Tod Inlet Plant

SIGNIFICANT confirmation of the increased activity in sight in the construction realm in the northwest is found in the fact that the British Columbia Cement Co., Ltd., is preparing to reopen for operation its second plant at Tod Inlet, which has been lying idle for the last 10 years. For the past decade the company's manufacturing operations have been concentrated at the Bamberton plant on the Malahat side of Saanich inlet.

The capacity of the Bamberton plant is 3000 bbl. a day, if operated to full capacity, while that of the Tod inlet plant is 2000 bbl. a day, if worked to capacity, according to Edwin Tomlin, managing director of the company. Together the two plants have a total capacity of 1,500,000 bbl. a year.

Large quantities of cement will be used for the next couple of years by the British Columbia Power Corp. in the extensive power developments at Ruskin on the Stave river and at Bridge river and Seaton lake.

The Tod Inlet plant, where men are already at work pumping out old limestone holes and overhauling the massive machinery and huge rotary kiln, is adjacent to the world famous Butchart gardens. In fact, the majority of the garden area is included in what was once an ugly excavation left by the removal of large quantities of the fine limestone used in the manufacture of cement at this plant in the past years.

Coincident with the preparations to place the company's second plant in operation and increase the production, if required, to as high as 5000 bbl. a day, the British Columbia Cement Co. this month reduced the price of cement 20c. a barrel, according to announcement by Mr. Tonslin.—*Vancouver (B. C.) Evening Sun.*

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1927 AND 1928

Month	1927—Exports		1928—Exports		1927—Imports		1928—Imports	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	75,346	$254,072	56,400	$204,875	193,175	$269,661	234,753	$342,797
February	71,404	233,985	62,828	221,620	130,421	200,680	164,408	217,525
March	67,956	240,165	74,983	265,719	181,145	261,519	235,930	330,074
April	72,383	243,832	61,676	205,882	192,318	313,262	249,458	324,371
May	59,332	205,574	70,173	236,005	178,929	263,618	190,509	256,872
June	69,205	237,281	59,536	201,313	129,111	201,682	266,537	359,637
July	72,337	249,737	83,759	291,055	175,042	249,665	112,887	151,877
August	61,371	209,198	88,736	302,866	117,605	170,167	259,988	358,858
September	57,890	207,817	71,995	252,843	233,066	304,796	173,439	226,295
October	67,639	230,668	62,137	246,010	221,274	321,777	152,210	226,909
November	79,764	257,428	69,313	260,310	141,485	190,419	67,240	92,468
December	62,099	226,960	63,120	250,204	156,609	209,205	175,992	233,300
	816,726	$2,796,717	824,656	$2,938,702	2,050,180	$2,956,451	2,283,351	$3,120,983

Philadelphia Sand and Gravel Producers Plan Combine

THE CHARLES WARNER CO. of Wilmington, Del., is carrying on negotiations, reported to be virtually complete, for the purchase of the entire business and holdings of the Van Sciver Corp., of Philadelphia, Penn., for a sum said to be "at least $10,000,000."

Irving Warner, vice-president of the Warner company, admitted February 6 that such negotiations were in progress, but said he could not amplify his statement.

The Van Sciver Corp. is one of the largest developers and manufacturers of lime, sand and gravel products in this part of the country. The Warner company is one of the oldest houses in the East engaged in similar activities. Officials pointed out that no merger of the two concerns was contemplated, but that the negotiations looked to the buying out of one big company by the other.

That, it was said, would make the Warner company one of the largest of its kind in the world, giving it control of the lime, sand and gravel business in the Pennsylvania, New Jersey and Delaware district and also in large sections of other nearby states, besides its regular large volume of business outside the Middle Atlantic states.

Sale of the Van Sciver interests, when completed, will bring under the control of the Charles Warner Co. two large sand and gravel plants on the shore of the Delaware a few miles south of Trenton, a large lime plant near Paoli with extensive stone deposits and much land, four large retail yards in Philadelphia, and a fleet of approximately 100 barges and tugs.

The plant near Trenton, in the Tullytown-Morrisville area, has huge deposits of sand and gravel on nearly 1500 acres.—*Philadelphia* (Penn.) *Public Ledger.*

Another City Turns to Foreign Cement

ARGUMENTS by dealers of domestic cement that their product be used by the city of Providence, R. I., instead of foreign cement failed to obtain results from the board of contract and supply recently when that body awarded the contract for furnishing the city 15,000 bbl. of cement to the James A. Potter Co. This concern, which handles a foreign cement, was low bidder with a figure of $1.99 per bbl. when the bids were opened.

As was the case a year ago when a similar situation arose, the domestic cement dealers argued before the supply board that preference should be given the local product. The contract body, however, having investigated the issue thoroughly a year ago, awarded the contract for the foreign product on the grounds that it was considerably cheaper and just as good quality.—*Providence* (R. I.) *News.*

Texas Gypsum Products Co. Building at Finlay, Tex.

CONSTRUCTION of a large plant for the manufacture of gypsum products is under way at Finlay, Texas, by the Texas Gypsum Products Co. and the company already owns a large deposit of gypsum situated adjacent to the plant site. The construction of the new plant will cost more than $200,000, according to Frank Akerman of El Paso, manager. Besides wallboard and plaster, hollow tile will be made in large quantities. Gypsum for building and manufacturing purposes will be shipped to El Paso and to eastern markets, Mr. Akerman said. The property is on the Southern Pacific.

Gypsum deposits in the Finlay mountains are said to be among the most extensive and purest in the country. Recent geological surveys made of the deposit indicate that there are 10,000,000 tons of the material.

Monolith Portland Plans National Distribution

COMPREHENSIVE changes in the policy of the Monolith Portland Cement Co. preparatory to instituting nation-wide distribution of its products, were announced by Coy Burnett, president of the concern, following their approval at the annual meeting.

Giving the company an appraised valuation in excess of $10,000,000, an exchange of common stock has been effected through which control of the Monolith Portland Midwest Co. now is vested in the Monolith Portland Co., it was explained. The Midwest company recently started operations in its new $2,000,000 cement mill at Laramie, Wyo. Plans provide for the future listing of the stock of the Monolith Portland Cement Co. on the Los Angeles Exchange.

"Prospects for building and other construction are favorable and indications are that the year 1929 will be marked by good business conditions," said Mr. Burnett. "When production was started at Monolith, Calif., in 1920, approximately nine years ago, the annual consumption of cement in Southern California was about 3,000,000 bbl. This year it is confidently expected to reach 8,000,000 bbl. Today, the per capita consumption of cement in this territory exceeds that of almost any other similar-sized area."

Involving the expenditure of approximately $500,000 an expansion program has just been completed at the California mill of the Monolith interests, it was announced at the stockholders' meeting by C. A. Low, vice-president and general manager. Improvements at the quarry and construction of a pack house capable of handling a daily output of 10,000 to 12,000 bbl. are included.

Reviewing the year's operations, Mr. Low announced that a substantial volume of business was handled and satisfactory earnings made during 1928, despite a slackening of building and road construction in the territory.—*Los Angeles* (Calif.) *Times.*

Lehigh Portland Offers Prize for Airport Design

A NATIONAL competition for airport designs with a prize of $10,000 for the winner, was announced recently following a meeting of a committee of architects in the Ritz-Carlton. The prize has been offered by the Lehigh Portland Cement Co., which will bear the expenses of the contest.

Harvey Wiley Corbett, architect, has been appointed chairman of the program committee, which will draw up specifications for the contest and also will be foreman of the jury of awards. These will be based upon reports made by the architects' committee and other committees representing the engineering profession, the aviation industry and municipalities and city planners.

It is hoped that the contest will bring out a design that may be taken as a standard by cities preparing to establish municipal airports.—*New York Herald Tribune.*

National Lime, Cement and By-product Corp. to Build at Tuscumbia, Ala.

CONSTRUCTION will be started during the year on a $300,000 lime kiln, approximately five miles west of Tuscumbia, Ala., on the Lee highway, it was announced recently by F. L. Hoff, president of the National Lime, Cement and By-Product Corp. of Buffalo, N. Y.

Tracts of land totaling approximately 300 acres, comprising a solid block, have been purchased. These lie between and afford frontages on the Tennessee river and the Southern railway, the announcement stated. Mr. Hoff reported that Thomas K. Morris, a lime engineer of considerable experience in the operation of plants, who is vice-president and general manager, has been in the district for some time and he is said to have pronounced the National company's tract exceptionally well located, especially as regards both water and rail transportation.

Completion of plans for the erection of the plant by spring is expected under the direction of Mr. Morris, who will stay in the district, but definite announcement of the date construction will start has been withheld pending final decision on the type of plant to be erected. It was stated, however, that the initial unit would have a capacity of 1000 bbl. per day and that additions will be made as rapidly as trade conditions justify. Crushing and other equipment to supply flux, ballast, riprap, concrete aggregates and agricultural stone will be installed, it was announced.

Estimates show 100,000,000 tons of stone on the property of the National company and analysis of many samples are said to show the carbonate of lime 98.70 to 99.50% pure and free from magnesia. Such stone is expected to make chemical lime such as is used in paper and sugar mills of the south.—*Sheffild* (Ala.) *Tri-Cities Daily.*

P. C. A. Regional Safety Meeting at Kansas City

THE SECOND of the 1929 series of cement mill safety meetings was held at the Kansas City Athletic Club, Kansas City, Mo., Tuesday, February 12. Past meetings were eclipsed both in interest and attendance. The following plants were represented: Ash Grove Lime and Portland Cement Co., Chanute, Kan., and Louisville, Neb.; the Atlas Portland Cement Co., Independence, Kan.; Consolidated Cement Corp., Fredonia, Kan., and Mildred, Kan.; Dewey Portland Cement Co., Dewey, Okla.; Lehigh Portland Cement Co., Iola, Kan.; Lone Star Cement Co. of Kansas, Bonner Springs, Kan.; Missouri Portland Cement Co., Independence, Mo., and Monarch Cement Co., Humboldt, Kan. Louis J. Wheeler, superintendent of the Lone Star Cement Co. at Bonner Springs, was chairman of the local committee in charge, and G. C. Gardner (Ash Grove), C. A. Swiggett (Lehigh), and P. F. Balfour (Missouri), also served on the committee.

Morning Session—Prevention of Infections

After the opening by Chairman Wheeler, J. A. Lehaney, vice-president and general manager of the Lone Star Cement Co. of Kansas, spoke interestingly of the executives' interest in accident prevention. His remarks, in full, are presented below. Following Mr. Lehaney, Dr. L. D. Johnson, plant surgeon of the Ash Grove Lime and Portland Cement Co., at Chanute, Kan., for several years, gave one of the most instructive talks presented to the cement workers so far. Dr. Johnson stressed the fact that infections constituted one of the most serious menaces so far as industrial accidents are concerned. "Keep down infections and you will prevent the great source of lost time," said Dr. Johnson, quoting statistics. His remarks were directed largely to those whose duty it is to administer first aid, calling attention particularly to the necessity of keeping water off wounds, for avoiding salves and various substances sometimes believed effective, but usually dangerous or at least a hindrance in effective treatment of cuts, bruises and abrasions.

J. A. Lehaney

Dr. Johnson spoke at considerable length of the danger from injuries involving perforations. He stated that the fact so many get away without infection from perforated injuries is the principal source of danger. It is the common impression that they are not dangerous. Nevertheless, as the doctor pointed out, perforations are extremely dangerous and lead to a large percentage of fatal terminations. Dr. Johnson pleaded with the mill men to take the fight against infection to the home and community, where so much needed, and he pleaded for the development of a department or classification of specialized industrial surgeons, to practice more efficiently in the industrial accident field.

Handling Explosives

The third paper of the morning was presented by R. F. Summer, technical representative of E. I. du Pont de Nemours and Co. Mr. Summer pointed out that an explosive is a potential hazard from the time loading starts until the charge is fired. He pleaded for the enforcement of strict discipline among workmen using or working around explosives and warned against ignorant men and wiseacres as equally dangerous in quarry operations. He advocated limiting the force as much as possible—keeping the use of explosives in the minimum number of well-trained men. As an indication of the possibilities of handling explosives without danger, Mr. Summer stated that over 43,000,000 lb. of explosives had been transported in the United States in 1928 without

One of the sessions of the Southwestern Regional Safety Meeting of the Portland Cement Association at Kansas City, Mo., on February 12, 1929

the loss of a single life and with a property loss of only $43.

The one hundred delegates to the meeting sat down to luncheon together in the roof garden of the Athletic Club with P. F. Balfour, assistant superintendent of the Missouri Portland Cement Co.'s Kansas City plant, acting as chairman. Rev. L. M. Burkhead, of Kansas City, made a remarkable luncheon address in which the moral responsibility of workers to protect each other, and to protect themselves in the interests of their families, was stressed.

Afternoon Session

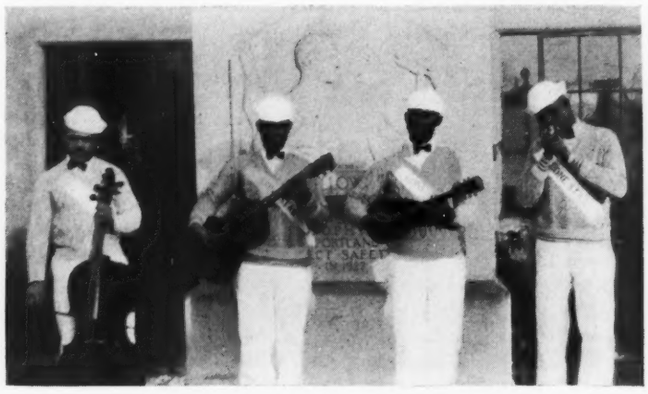
F. C. Lynch, director of the Kansas City Safety Council, opened the afternoon session with a spirited discussion of "Keeping Up Safety Enthusiasm." High compliment was paid by Mr. Lynch to the progress of accident prevention in the cement industry and he said that it was almost unique. Mr. Lynch stated that the mere fact that cement mill accidents are decreasing so rapidly shows that the cement industry has solved the problem of keeping its workmen interested in safety.

Louis J. Wheeler

R. M. Cowpland, engineer, Hercules Powder Co., presented a helpful paper (to be published later) which served as an introduction to the round-table discussion which occupied almost three hours: "Quarry, Clay Pits and Crushing Accidents," C. I. Perry (Atlas), J. A. Fisher (Lehigh), and M. E. Stephenson (Monarch); "Milling," J. G. Stadler (Lehigh) and W. F. Shaffer (Monarch); "Burning and Fuel," E. E. Harris (Consolidated, Mildred), and R. Hedrick (Consolidated, Fredonia); "Power and Shops," H. R. Williams (Ash Grove); "Railroad and Yards," G. W. Burgess (Missouri).

W. D. Ryan, Safety Commissioner, United States Bureau of Mines, Kansas City

Mr. Burgess' paper, with which the afternoon session was closed, will also be reproduced later.



Lone Star Cement Co. Quartette which entertained at the Kansas City dinner meeting

Safety Dinner

The annual safety dinner of the southwestern group mills was held in the roof ballroom of the Athletic Club at 6:30 p. m. About 150 covers were laid for the 125 delegates and a number of guests, including ladies, who accompanied the delegates.

F. C. Lynch

Baxter D. McClain, manager of the Cement Information Bureau of Kansas City, acted as toastmaster. Mr. McClain, who has been connected with the Kansas mills for twenty years or more, in various capacities, gave some very interesting sidelights on operating conditions during earlier days.

Dinner speakers included J. F. Davies, mining engineer, U. S. Bureau of Mines; W. D. Ryan, safety commissioner, U. S. Bureau of Mines, and Fred Karr, general manager of the St. Joseph Gas Co.

Entertainment was provided by the "Lone Star" quarry safety quartette and the Jolly Jones Night Club entertainers, and music by the "Red Wing" orchestra of the Missouri Portland Cement Co. G. W. Burgess of the latter company acted as director of the community singing.

Registration

Ash Grove Lime and Portland Cement Co.
A. Lunteigen, vice-president.
W. P. Sabin, secretary.
(Chaunte, Kan., plant)
F. E. Bartholomew.
Guy O. Gardner, superintendent.
L. D. Johnson, physician and surgeon.
O. D. Nelson, fuel agent.
C. C. Reid, chief clerk.
H. R. Williams, chief engineer.
W. J. Wilson.
(Louisville, Neb., plant)
A. K. Frolich, superintendent.
Atlas Portland Cement Co. (of Kansas)
L. J. Williams, district sales manager, Kansas City, Mo.
(Independence, Kan., plant)
C. M. Carman, plant manager.
D. E. Carpenter, repair department.
Fred J. Davis, personnel director.
F. D. Harris, electrician.
C. D. Posey, electrician.
Charles T. Perry, driller.
Ivan C. Pitts, repairman.
Consolidated Cement Corp.
(Fredonia, Kan., plant)
Alonzo Conrad, power department.
J. W. Dennis, chemist.
R. Hedrick, night mill foreman.
Sylvester Mount, packing foreman.
William Palmer, superintendent.
Chas. W. Parsons, foreman, power department.
Chas. Verahen, chief clerk.
S. G. Willis, burner.
(Mildred, Kan., plant)
E. L. Drury, superintendent.
E. E. Harris, assistant superintendent.
L. W. Black, foreman, sack department.
L. H. Farmer, assistant chemist.
W. W. Hughes, carpenter foreman.
J. E. Ketchum, shift foreman.
J. A. Sutterly, machine shop foreman.
N. S. Royce, operating foreman.
C. J. Sutton, operating foreman.
Lehigh Portland Cement Co.
E. T. Brown, district sales manager.
(Iola, Kan., plant)
A. A. Brune, stenographer.
Wm. B. Ledford, factory foreman.
E. C. McCoy, storekeeper.
J. A. Mesher, quarry foreman.
C. E. Russell, chief clerk.
J. G. Stadler, chemist.
C. A. Swiggett, superintendent.
W. A. Woodruff, carpenter.
Lone Star Cement Co. (Kansas)
J. A. Lehaney, vice-president.
E. Struckmann, general superintendent.
(Bonner Springs, Kan., plant)
N. M. DeBruin, assistant superintendent.
Harry Alexander, beltman.
Raymond L. Atkisson, shipping clerk.
Claude A. Benson, carpenter.
Dr. Fred Candler, surgeon.
Harold Clawson, truck driver.
E. M. Clark, electrician.
J. E. Cline, truck driver.
Geo. P. Davenport, shovel operator.
Ernest Dickoff, blacksmith.
Edward Early, burner.
L. H. Fitzpatrick, machinist.
Joseph Fowler, repairman.
Robert G. Gibbs kiln feeder.
J. H. Griffith, assistant chemist.
R. Z. Harris, stenographer.
C. G. Heckert, cost clerk.
Chas. W. Herrick finish grinder.
H. C. Hulsey, coal tank tender.
Charles W. Keirns, mill foreman.
Nathan C. Keirns timekeeper.
R. P. Kindred crane operator.
Ben G. Mills, motor tender.

Baxter McClain

W. B. Mills, repair foreman.
Carl Musgrove, gas locomotive engineer.
Lewis P. Overton, yardman.
Louis Pigg, beltman.
Raymond Price, machinist helper.
Oscar W. Rawley, repairman.
P. Reichmann, finish tube miller.
Robert M. Scott, power house operator.
C. P. Steventon, purchasing agent.
C. E. Smith, shop foreman.
Frank Wasser, sack department.
J. W. Wasson, quarry foreman.
L. J. Wheeler, superintendent.
R. W. White, carpenter foreman.
E. R. Willis, welder.
E. A. Wright, quarry.
P. L. Yelton, pipefitter.

Lone Star Cement Co. (Texas)
J. A. Wheeler, vice-president.

Missouri Portland Cement Co. (Independence, Mo., plant)
P. F. Balfour, assistant superintendent.
G. W. Burgess, construction engineer.
Wm. Clickner.
Geo. Gruhl.
H. M. Hutcheson, powder man.
H. B. Irving, foreman.
C. E. McCormick, repairman.
John P. Stewart, chief electrician.
G. E. Zeers, assistant chemist.

Monarch Cement Co. (Humboldt, Kan., plant)
Fred Crane, mill foreman.
J. B. McClellan, boiler room superintendent.
C. L. McWherter, mill foreman.
W. C. Shaffer, master mechanic.
M. F. Stephenson, chief electrician.
W. G. Sadler, shale foreman.

Portland Cement Association
Charles A. Clark, manager, southwestern offices.
A. J. R. Curtis, assistant to general manager.
R. M. Simmrall, district engineer.

United States Bureau of Mines
Joseph F. Davies, assistant engineer, Vincennes, Ind.
W. D. Ryan, safety commissioner, Kansas City, Mo.

Others
H. C. Burgess, engineer of industrial relations, Kansas City Public Service Co.
E. M. Cowpland, Hercules Powder Co., Joplin, Mo.
F. W. Harper, E. I. du Pont de Nemours and Co., Kansas City, Mo.
H. G. Jacobsen, Bates Valve Bag Co., Chicago.
F. C. Lynch, director, Kansas City Safety Council.
Baxter D. McClain, manager, Cement Information Bureau, Kansas City, Mo.
John McCullagh, Jr., Hercules Powder Co., Kansas City, Mo.
R. H. Summer, technical representative, E. I. du Pont de Nemours and Co., Wilmington, Del.

Texas Regional Meeting

THE second annual safety meeting of the Texas cement mills was successfully held at Hotel Baker, Dallas, on February 14. C. E. Ulrickson, vice-president of the Trinity Portland Cement Co., acted as chairman of the local committee and presided during the morning session and at the dinner. J. J. Horgan and J. W. Ganser of the Trinity company, Lewis R. Ferguson, vice-president of the Lone Star, and District Engineer Simpson of the Portland Cement Association also assisted in arranging local details.

The 1928 accident record for the Texas mills, as related by A. J. R. Curtis, assistant to general manager of the Portland Cement Association, indicated that the plants in that vicinity had reduced their accidents only 4% during the year, as compared with a general reduction of 23% for all of the mills in the association membership. Mr. Curtis gave as one reason the fact that the Texas mills had already reached an accident rate considerably lower than that of the industry as a whole. Whereas the average rate for all mills reporting to the association was 7.3 accidents per mill in 1928, last year's rate for the Texas mills was only 6.1 accidents per mill.

Lewis R. Ferguson

Additional program numbers were as follows:

"A Trophy for Every Cement Mill in Texas"—C. W. Ganser, chief chemist, Trinity Portland Cement Co.

"Perfecting a Safety Campaign"—F. H. Kerr, safety engineer, Lumbermen's Reciprocal Association, Fort Worth, Texas.

"Safe Handling of Explosives"—G. H. Summer, technical representative, E. I. du Pont de Nemours and Co., Wilmington, Del.

"The Safety Program in a Small Plant"—R. G. Sutherland, superintendent Houston plant, Trinity Portland Cement Co.

"One Hundred Per Cent First Aid Training and Its Results"—K. L. Marshall, division mining engineer, U. S. Bureau of Mines, McAlester, Okla.

The central theme of the meeting was "Better Organization for Safety," the objectives being to win a Portland Cement Association trophy for every mill in Texas this year and next. With the San Antonio mill and the Dallas mill of the Trinity company already winners, and with several other mills which have completed a year with only one accident each, the outlook for success was regarded as most favorable.

First-Aid Training

Mr. Marshall, who is an engineer of long experience in safety training and mine rescue work, paid high compliment to the improvement made during recent years in the cement mill accident record and explained the training work of the Bureau of Mines in detail. "It is a fact," said Mr. Marshall, "that men who have been trained in first aid work don't get hurt. That is a good argument for the training of every last workman in all of the cement mills of the United States. I think you will agree with us that the quicker all of these men can be thoroughly trained,

Regional Safety Meeting of the Texas cement mills, held at Dallas on February 14

the better it will be for safety.

"Of course it would be quite impossible for Bureau of Mines instructors to train over 40,000 men during the next three months while you are concentrating on this work. However, I believe practically all of them can be reached inside of six months by selecting a number of the best students to act as instructors for additional classes to follow the big schedule now planned. The

J. W. Ganser

Bureau of Mines will examine all men trained by student instructors in order to be sure of their efficiency and will issue certificates to all men trained in this way who make suitable proficiency. I am sure that this program of first aid training, enthusiastically undertaken, will prove the biggest factor in winning a trophy for every Texas mill."

One of the most valuable numbers on the program was a demonstration of various examples of first aid work by the team of the Trinity plant at Fort Worth. C. W. Simms, safety engineer of the Southwestern Bell Telephone Co. at Fort Worth, directed the team and gave a short explanatory address. It is expected that a contest of similar teams can be arranged for next year's safety meeting.

Executive Viewpoint

Lewis R. Ferguson, vice-president of the Lone Star Cement Co., Texas, presided at the luncheon. Mr. Ferguson made an address of unusual interest in explaining how vital accident prevention work is from the viewpoint of the executive. Mr. Ferguson drew attention to the fact that cement mill accidents have been rapidly approaching the zero line and surprised his listeners by inviting them to consider possibilities "beyond the zero line." Mr. Ferguson foresaw cement mills as safer than the homes or communities; as safety havens from which protective propaganda would reach to prevent accidents in the entire community around. He foresaw, in the near future, universal physical examination of cement mill workers and a condition brought to pass where the health of cement mill workers would average better than that of the community in general. Periodical examinations and the teaching of hygiene and good housekeeping in the mill and quarry would do the work so simply and quickly that they are bound to come in this enlightened day, Mr. Ferguson said.

Mr. Ulrickson appeared in his usual good form as toastmaster at the dinner. Major M. J. McCombs, the first speaker, explained Texas accident insurance rates and predicted another reduction, possibly as great as 40%, as a result of the great improvement in accident prevention. The second speaker, C. J. Crampton, who is manager of the Dallas Safety Council and also director of safety for the Dallas Power and Light Co., talked about personal troubles as an underlying cause of accidents and told how his company had investigated and put an end to many troubles of one kind or another which took men's attention off their work and made them potential targets for accidents.

Registration

The registration at the meeting was as follows:

Lone Star Cement Co., Texas—General
Lewis R. Ferguson, vice-president.
E. Struckmann, general superintendent.

Dallas, Texas, Plant
J. E. Bonnell, superintendent.
R. L. Baird, miller.
C. W. Baley, yard man.
Amos Bietendorf, chemist.
F. C. Burkhardt, assistant chemist.
Owen Carter, driller.
George G. Cooper, assistant cost accountant.
W. H. Curtin, repairman.
K. E. Davis, quarry foreman.
William Dietz, quarry repair foreman.
Lewis L. Dillon, chemist.
S. C. Evans, repairman.
F. F. Fasting, packing foreman.
E. S. Farrell, electrician.
O. L. Hailey, chief chemist.
B. Hall, electrician.
A. H. Hamilton, chief electrician.
G. R. Harper, general mill foreman.
E. A. Hume, burner.
W. H. Kelsey, foreman.
E. R. Kirkham, electrician.
H. M. Krabbe, assistant superintendent.
Cecil Lindsay, machinist.
Willis Lunday, electrician.
R. N. Miers.
I. O. Mitchell.
W. E. Mitchell, chemist.
Riley Scuders, truck driver.
G. T. Smith, shovel engineer.
J. Hugh Sparks, storekeeper.
I. W. Talbot, head oiler.
Otis J. Tibbetts, repairman.
J. D. Wilson, general repair foreman.
L. M. Winford, chemist.

Houston, Texas, Plant
C. J. Lofstadt, superintendent.
R. R. Bailey, sack clerk.
B. F. Coffman, mill foreman.
M. M. Niel, electrician.
W. H. Tilley, chief chemist.

Trinity Portland Cement Co.—General
C. E. Ulrickson, vice-president.
S. A. Hilton, electrician.
Henry T. Lamb, general foreman.
George McDowell, foreman.
G. M. Orr, timekeeper.
E. S. Pickins, foreman.
J. R. Poindexter, packing foreman.
W. T. Ross, carpenter foreman.
W. O. Stuart, chief electrician.
J. D. Summers, chief power engineer.

W. A. C. McCourtie, president of the Trinity company

J. J. Horgan, purchasing agent.
O. V. Bartholomew, general superintendent.
George P. Diekmann, chemical engineer.
H. B. Gillette, district sales manager, Houston.

Dallas, Texas, Plant
J. W. Ganser, assistant superintendent.
R. O. Bartholomew, engineer.
Fred Burkett, engineering department.
A. C. Carr, foreman.
S. A. Davidson, mill foreman.
D. D. Day, stock keeper.
L. M. Fisher, quarry foreman.
Ben Hammond, mill foreman.
C. A. W. Sutherland, master mechanic.
W. K. Williams, chemist.

Fort Worth, Texas, Plant
A. A. Cheney, superintendent.

C. J. Crampton

R. E. Diehmann, chief chemist.
Harley Fleming, chief electrician.
R. E. Galbreath, machine shop foreman.
J. S. Giles.
A. G. Morris, shipping foreman.
T. C. Pulley, construction department.
J. M. Simmons, chief clerk.
T. W. Smith, labor foreman.
L. Wirders, mill foreman.

Houston, Texas, Plant

R. G. Sutherland, superintendent.

Portland Cement Association

A. J. R. Curtis, assistant to general manager.
C. F. Simpson, district engineer.

Others

E. M. Copeland, Hercules Power Co., Joplin, Mo.
C. J. Crampton, manager, Dallas Safety Council.
Thomas E. Gibson, manager, engineering department, Lumbermen's Reciprocal Association, Houston.
L. B. Holoday, district representative, Lumbermen's Reciprocal Association.
F. T. Kerr, safety engineer, Lumbermen's Reciprocal Association.
M. J. McCombs, engineer, Texas Employers Insurance Association, Dallas.
K. L. Marshall, district engineer, U. S. Bureau of Mines, McAlester, Okla.
C. W. Simms, safety engineer, Southwestern Bell Telephone Co., Fort Worth, Texas.
R. H. Summer, technical representative, E. I. du Pont de Nemours and Co., Wilmington, Del.
W. F. Wise, president, National Crushed Stone Association, Dallas, Texas.

E. Struckmann

Prevention of Railroad and Yard Accident at Mills*

By G. W. Burgess

Construction Engineer, Missouri Portland Cement Co., Independence, Mo.

THE subject given me is "Yards and Railroads," and while I have had no real experience along these lines, I have managed during my 21 years around cement plants to observe many things pertaining to these departments. In the first place, my impression of a yard foreman is that he should be a man of ability. Not like the Irish section boss who fired all his men just to show his authority, but a man who is able to adapt himself and become conversant with all the departments and machinery throughout the mill. This necessarily means that he must be a safe man, for he must be capable of loading and unloading all classes of machinery and materials that are in general use in a cement plant. He is at the call of all the other foremen in the mill, who must give him the best of cooperation to obtain the best results. This general ability man has many duties and among them I might mention the matter of keeping the yards clean and free from obstructions over which one might trip or fall; seeing that materials are safely piled, supervising the sanitary arrangements, the distribution of ice and fresh water supply.

Yard Gang a School

The yard gang in my estimation is akin to a graduating school, for there, generally, the green hands are given the first work-out, and if they make good they graduate to other jobs in and around the plant. So here again you see the necessity for a good foreman, a man who can teach other men to work safely, for it is these first impressions that will last. This safety-first, or accident-prevention, teacher must be a man of ability, a leader, a man of patience and a man who can assimilate the load he has to carry.

In fact, an old acquaintance of mine who was a yard foreman for several years, but whose troubles are now ended, once summed up the situation as follows: To be a yard foreman is to lose all the friends a man ever had, to be a flunky for everybody and catch the hell the boss has to give somebody, and by God if you don't sprout wings you ought to. As you might guess, the gentleman was somewhat peeved at the time.

Another element which we have to consider seriously is the matter of foreign labor, and it is this situation that calls for intensive education. My experience has been that the average foreigner is attracted by bulletins and the more these are displayed using translation, the better the results. One good system which I have in mind is the Elliott, which supplies up-to-the-minute subjects all the year round. The average yard gang has more responsibilities than a dog has fleas, but the dog has the advantage inasmuch as he can get rid of the fleas.

In summing up the yard situation, it seems to me that a safety job started by it is the beginning of safe operation as the members of this gang cannot afford to take a chance (which puts me in mind of the traveling salesman who received this wire while on the road: Your mother-in-law is dead, shall we embalm, bury or cremate? He replied, Embalm, bury and cremate, take no chances).

Prevention of Railroad Accidents

Regarding the railroading end of this talk, I am afraid that I am lacking in knowledge to be able to put this subject before you in a proper manner, I do know that great vigilance has to be used in keeping accidents down to a minimum, for the hazards are many and the conditions are not changed as long as your plant is in operation. The locomotive power, whether it be steam, gas or electric, is at all times a menace to safety in some form or other; and too much attention can not be given to their upkeep. The tracks on which they run must be kept in A-1 shape or derailments will occur, resulting in damages to locomotives or possible injuries to the crew.

Switches are some of the many things that have caused a number of accidents in our experience, and too much stress cannot be put upon the matter of easy-moving, switch-throwing apparatus, that is at the same time safe.

The track foreman and crew are primarily responsible for a smooth running railroad, and it is up to them to see that nothing happens that will put a track out of commission, such as broken rails, loose fish plates, split switches or bad places in the track. For instance it is by neglect that accidents often happen and we cannot drill the track gang too much on the necessity of close observance. This might be well illustrated by the following story: A road boss on a certain railroad once jumped on the section boss regarding the fixing of a bad spot on one of the tracks which was under his supervision. "Pat, do you know that there is a bad spot at pole No. 333?" "Faith and sure I know it, haven't I been lifting me hand car over it for the past three weeks? I'm playing safety first."

Hazard of Open Doors

One very important item in my estimation is the matter of cars, whether they be system or cars operated by the company. I mean in doors being left down on cars that have been unloaded of coal or gypsum. The railroads have a strict ruling on the moving of cars without doors properly in place, but I am sorry to say that this rule is not always adhered to. It is a dangerous practice and should be stopped.

One other item that I might mention is moving between cars when a locomotive is attached or when a cable drag is being used. You all know what dire results this may lead to, and yet we have had reports from the Cement Association giving details of just such accidents happening.

In conclusion I want to say this, that no matter what our job or position may be with the company by whom we are employed, it is up to us as individuals to help and protect our fellow man; and if education along safety lines is necessary, then it is up to us to give the best we have.

*Discussion at Kansas City Safety Meeting of the Portland Cement Association.

Nonmetallic Minerals Discussed at Institute of Mining Engineers

ABOUT 25 mining engineers attended the sessions and luncheon of the nonmetallic committee of the American Institute of Mining and Metallurgical Engineers in New York City, February 18. ***Dr. Oliver Bowles,*** U. S. Bureau of Mines, Washington, D. C., chairman of the committee, presided at one session and ***W. M. Weigel,*** Missouri Pacific Ry., St. Louis, Mo., vice-chairman, presided at the other session.

Soapstone in Virginia

C. W. Ryan, mining engineer and geologist, Lynchburg, Va., gave a sketch of the geology of the soapstone deposits of the Piedmont section of Virginia, with a description of the methods of prospecting, developing quarries, quarrying and milling methods. He described soapstone as "of the igneous metamorphic type, thought to be an alteration product resulting from the introduction of magnesia and the addition of upward rising carbon dioxide and water in a heated condition into basic igneous rock." He described the location of the veins of soapstone and talc in this section in detail.

Mr. Ryan's theory of the formation of these particular deposits is as follows: "The original shists that were introduced were subjected to considerable movement, which resulted in the breaking off and crushing of quantities of these country rocks. These fragments were assimilated by the molten intrusives and the magnesium gases, together with many others, were liberated in large quantities to find their way up through the peridotite. These gases were absorbed by the upper areas and soapstone was formed.

The location of diamond-drill holes for prospecting soapstone deposits is dependent on two main factors: (1) the strike and dip of the stone and (2) the nature of the topography. The drilling of soapstone should be conducted to cut the ledge as nearly as possible at right angles to the strike. This is generally accomplished through observation of the outcrop, although at times it is impossible to obtain sufficient data to enable one to point the holes correctly. In such a case the only thing to be done is to drill two or three trial holes so as to cut the ledge below the oxidation horizon. By this method it is often possible to prove the formations by very little drilling, which saves cost.

In stripping and opening soapstone quarries high explosives must be used with great caution to avoid shearing the deposit and rendering it useless. Hydraulic stripping is recommended. Virginia soapstone quarries are usually relatively small—not exceeding 100 ft. in width and length, and not often 250 ft. in depth. Channeling machines are used to slice the stone at right angles to the strike of the ledge—called "layer cuts." Channeling machines are also used in making "end cuts" at the hanging and footwall sides of the quarry. Under-cutting machines are used to make the bottom slice of each layer. After removing a "wedge" on the end cut along the hanging wall, jackhammer drills are used for "plug-and-feather" holes, to break out the blocks with the grain. One of the chief problems is the disposal and utilization of waste. The blocks of soapstone are graded and subsequently milled and shaped for various uses.

The grades of stone suitable to the various uses are distinctive. For electrical equipment a medium hard stone free of minerals that conduct current is required. The foliated massive variety found in the middle vein is generally used for this purpose. For table tops and laboratory equipment the stone must be free of both siderite and calcite veinlets. The reason for this is that the value of the stone in such uses is directly dependent on its ability to resist acids. Stair treads are made of the harder variety of stone, particular attention being given to uniformity of hardness, which will give an evenly wearing surface. It is claimed that the stone from some of the quarries operating at present has greater lasting qualities than marble. When the stone is to be used for purposes in which it is subjected to moderate heat, the soft varieties are commonly used. It is only in uses which require the application of excessive heat that attention is paid to the texture. For firebrick, furnace lining and firebricks the most satisfactory grade seems to be that of an open texture.

Barite in Missouri

W. M. Weigel, mining engineer, Missouri Pacific Ry., St. Louis, Mo., described the economic deposits of barite in Missouri and the methods of recovery. In general the deposits are small and the methods of recovery very crude—mostly hand mining on a contract basis; in 1928 the cost being about $3 per ton. A few mines use small revolving shovels and industrial railways. The pieces of barite have to be separated from clay and other impurities, and this is usually done by crude washing methods. At the more modern plants the standard practice is the use of log washers to remove the clay, followed by comparatively coarse crushing, jigging and table treatment of fines. Two washing plants of the National Pigments and Chemical Co., near Cadet, each handle 400 to 600 tons per day of nine hours. The value of the concentrated barite is $6 to $8 per ton.

Some consumers have their own mines and washing plants. Most of the production, however, is sold in the open market or on a contract basis. Some buyers operate a brokerage business, buying in small lots from the smaller producers and selling to the market that offers the best return. These buyers maintain docks or loading platforms at various shipping points, where the ore is accumulated. Here the ore is sometimes resorted and mixed to make a uniform grade. Sampling of shipments is rarely done at the point of origin. It is usual for the producer to accept the consumer's sampling and analysis. Deductions are made for moisture, especially on washed ore. There are no fixed standards of quality or grade, although there is a generally accepted grade for the lithopone trade and one for other uses, but both penalties and bonuses on this standard often vary with the individual contract or sale. The usual standard for lithopone is a minimum of 93% $CaSO_4$, barium sulphate, with not over 2½% combined alumina and iron oxide, and a penalty of 10c. per ton for each 0.1% Fe_2O_3 over 1%. Sometimes a bonus is paid for a $BaSO_4$ content greater than 93%, or for iron oxide content of less than 1%.

Barite is used in its natural state, pulverized, as a filler in rubber, paper, paint, etc., and as a flux in brass melting, in glass, etc. It is also used as a source of barium and barium salts in the manufacture of lithopone (paint pigment), blanc fixe, barium carbonate (ceramic industry, etc.).

Potash in Texas

G. R. Mansfield and ***W. B. Lang,*** U. S. Geological Survey, Washington, D. C., described the government potash exploration in Texas and New Mexico, and the nature and the location of the deposits. ***W. T. Schaller*** and ***E. P. Henderson,*** of the U. S. Bureau of Mines, Washington, D. C., described the mineralogy of the drill cores taken in in Texas and New Mexico.

Clay Mining

H. E. Nold, professor of mine engineering, Ohio State University, Columbus, Ohio, explained "the fundamental principles involved in examining a clay deposit for both quality and quantity, and in operating a clay mine, either open-pit or underground, so that the best quality of finished material can be made from the raw material available." His paper dealt with clay for refractories and other heavy clay products.

Indiana Limestone

G. F. Loughlin, geologist, U. S. Geological Survey, Washington, D. C., discussed Indiana oolitic limestone and the relation of its natural features to its commercial grading. This stone is probably more used than any other in this country as an architectural trim stone, and the problem of its accurate grading by color and texture has recently been studied extensively.

Bentonite in Arkansas

George C. Branner, mining engineer, Little Rock, Ark., described three bentonite deposits in southern Arkansas, suggesting that there may be large quantities of this material in the locality, accessible, easily mined and of probable future importance.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

National Concrete Products Association Meets in Detroit

Sessions Held in Conjunction with the American Concrete Institute Point Way to Wider Sale of Products

MERCHANDISING was the keynote of the fourth annual convention of the National Concrete Products Association, which met in the Book-Cadillac hotel in Detroit on February 11 and 12. This thought was reiterated by every speaker, each giving his own ideas on the subject and presenting it from a slightly different angle, but all agreeing that the big problem of the industry was to obtain better and more extensive salesmanship to meet competition which is becoming keener with each new day.

The Concrete Products Association adjourned its sessions at noon of the 12th so that the members could attend the meetings of the American Concrete Institute, whose sessions opened at the Book-Cadillac on that day. With these two groups meeting at the same time it was possible for the concrete products manufacturers to have the benefit of the technical sessions of the institute and also have their private discussion of their own peculiar problems. The A.C.I. sessions, attended by the products manufacturers on the afternoon of the 12th and all day on the 13th and 14th, were practically confined to technical problems.

Newton D. Benson, president of the association, called the meeting to order on the morning of the 11th and welcomed the members to the convention, expressing belief that much could be accomplished at the sessions to follow. He spoke of the optimistic outlook for the industry in general and urged the members to back up the association in putting across concrete units.

W. D. M. Allen, manager of the cement products bureau of the Portland Cement Association, reviewed the work of the industry in the past and looked toward the future in a talk on "What 1928 Brought Forth for the Concrete Products Industry." He stated in his talk that in the past there have been approximately 16,000,000,000 fireproof building units produced annually, including clay products, cement products and similar construction units. Of this about one-quarter, or 4,000,000,000, have been concrete units. Saying that it was unlikely that the number of units consumed would increase appreciably in years to come, he urged his hearers to go out and meet the competition of the other industries, and in this way to increase their annual output by increasing the percentage of cement units used at the expense of competitive units.

Low Percentage of Capacity Means Low Efficiency

Mr. Allen quoted statistics showing that the approximate annual production capacity of all products plants in the United States would be about 20,000,000,000 units, or 25% more than the total number of all kinds of units that the building industry now absorbs. The answer, of course, is obvious; since the plants are not producing more than are absorbed, they must be operating at a very low percentage of their possible capacity. It is estimated that the average plant is operating at only 15% of its possible capacity.

The products plant of the future, Mr. Allen said, will take care of its peak load periods by operating two shifts of nine hours each, or possibly three shifts of eight hours. Thus will the maximum return be obtained from a given equipment, or, in other words, capital invested overhead will be the smallest per unit produced. Mr. Allen pointed out that this had been accomplished successfully in other industries, notably in the steel industry, and that the concrete products manufacturers would soon find out that it was a necessity in their operation. In the manufacture of block, the cost of the aggregates and cement may be considered constant, and, with efficiently designed plants, the cost of actual production per unit will not vary greatly, so that the overhead item is the only thing where a saving can be made. It is toward spreading out this item over more units that Mr. Allen is working, and he has suggested the multiple shift idea as the solution. He declared that he felt sure it would bring up considerable discussion at the convention, but he was sure it was well worth the consideration of the members.

Mr. Allen went on to say that the chief reason the overhead must be cut was that concrete units must meet the prices of competitive materials. If concrete units are the same price, they are likely to be accepted because of their fireproof characteristics, but if they are higher in price there will be no sale generally. The exception, in regard to wood construction at least, is found in the fire-proof zones established by many cities where wood construction is prohibited. He mentioned Chicago as a conspiciuous example where 92% of the city is under such building restrictions, and only 8% is open at present for wood construction.

The multiple shift idea, he said, is not presented for the manufacturer whose plant is now producing all that his market will absorb. Rather it is for the manufacturer who intends to remodel his plant, or the man who is to build a new plant, either to replace an old plant or as an entirely new venture. This man can build a smaller plant, procuring thus a smaller overhead, and yet produce as many blocks as a single shift plant, if he uses multiple shifts. Of course, some changes of plant design would be necessary, and might build up the first cost slightly. Mr. Allen mentioned as a probable necessity faster curing, suggesting that steam curing at a higher temperature or at a higher pressure, or both, might be one solution.

Aggressive Merchandising Needed

During 1928 the plants of the United

States, totaling something more than 4000, added 100 new men to the number of their full-time salesmen selling concrete units exclusively. Mr. Allen pointed to this as a fine step forward in the aggresive selling campaign that is being urged on the manufacturers at this time. What is needed in the concrete products industry, he said, is more and better salesmen than the competitive industries are employing. Builders and architects must be made to understand that concrete units have climbed above the basement. Hundreds of thousands of cinder units have been used for back-up walls in Philadelphia skyscrapers. The largest building in the British Empire, the Sun Life Building in Montreal, is using several hundred thousand cement units, he pointed out.

Special Unit Jobs

A suggested means of increasing output is through rendering exceptional service by producing special units to fit particular jobs. This is not to be understood to mean that any fresh type of block should be built on demand, but frequently in large buildings a contractor will find a place where a few hundred, or even more, special block would save him a tremendous amount of money. Such places might easily be found around window casings or similar locations, and if the manufacturer is ready to supply these special blocks it is entirely probable that he will be given the order to supply the balance of the units in the building. Thus a small loss on the special unit may be easily made up on the larger order. When a salesman knows that he can promise such things and fulfill his promise he has an exceptional talking point.

Mr. Allen mentioned another line of special units, manhole block. He called attention to the fact that this highly successful unit is simple to manufacture but requires special merchandising to put across. City councils, municipal engineers, and sewer contractors must be convinced that this type of manhole is good, and Mr. Allen declared that this is no easy job.

The competitive industries have awakened to the fact that thorough knowledge of the product through continuous testing has been responsible for the large increase in the use of concrete units. Mr. Allen assured the delegates that those industries were preparing testing campaigns of their own to show the public that their products were good. The stamp of approval by the Underwriters Laboratories has been of inestimable value in selling concrete units, Mr. Allen said, but it was not enough to be satisfied with that when further tests could be made and more knowledge gained.

National Advertising Campaign

The Portland Cement Association is planning a national campaign to popularize concrete units in general. The series of advertisements will be broadcast over the whole country and it is hoped that manufacturers will tie up to them with local advertising. The advertising of the association will be general to all types of concrete units, but will include in side columns specific mention of one type of unit, as cinder block, sand and gravel block or slag block. By the time the series is complete each type will have been specifically mentioned once so there is no favoritism.

During the year just past the biggest progress has been made in the development of lightweight units. The superstructure of the future, Mr. Allen pointed out, would be of these lightweight units. Because of this, considerable experimenting must be done to determine just what the effect of shrinkage and expansion in these units will be. In a wall several hundred feet long, as is found in some of the structures now being built with these units, the shrinkage problem becames a serious thing.

So far the National Concrete Products Association has not worked on this phase of testing, and in fact has been doing very little toward testing at all. Mr. Allen said that the Portland Cement Association would do what it could both as to testing and as to merchandising, but he closed with a plea that the products association go into testing in a whole-hearted manner, and also that it raise money to help with national advertising campaigns.

Wallace I. Harris, of Milwaukee, Wis., briefly reviewed the history of the National Concrete Products Association since its inception in Chicago in 1919. He pointed out that its work now was too big to be left to volunteer workers, and that what the association needed was one or more paid men to give full time to the job of popularizing concrete units with the public. In speaking of the type of co-operation necessary from the individual manufacturer he urged that each producer become a member of the A. C. I., the National Concrete Products Association, and of his local trade organization. With co-operation the industry and the association can be built up, he said, and without it, the association will be buried.

Benjamin Wilk, president of the Detroit Concrete Products Association, welcomed the visitors and presented a few facts about the Detroit products industry that are of real interest. This association, he said, is now producing 15 million blocks annually, is at present hiring a paid engineer, and is occupying its own testing laboratory where the members blocks are tested.

Looking Ahead

In the afternoon session on the 11th, ***D. R. (Spec) Collins,*** of Milwaukee, vice-president of the Association, talked on "What of 1929?" He said that changes were coming so fast that he would hardly venture to say just what the coming year would bring. A review of the past, however, would help, he said, and he called attention to the period when a 4000-block job was an unusual order as compared with the present when jobs many times that size are not at all uncommon. The change in merchandising methods has brought this about, he declared, and the old time producer must change his merchandising ideas or go out of business. Merchandising has increased business 15% in the past and is the only salvation for the future, he said.

As a concrete example, Mr. Collins spoke of Milwaukee, where six years ago one firm hired a single salesman, who was then the only one in the district. The other plants looked upon it as foolish, but that plant soon doubled the output of any other plant, and now from 15 to 25 full-time salesmen are employed in the Milwaukee district.

The industry has competed against itself to such an extent, Mr. Collins said, that the price has been worked down so that there is only a very small profit on a single unit. Hence the sales volume must be increased to meet the overhead and fixed charges.

Quality Uppermost

The slogan of the cement products bureau of the Portland Cement Association must not be forgotten, he said. This is "A quality product, economically manufactured, and aggressively sold." The corners and costs must be cut everywhere possible, but the quality must never be cut as this is the biggest advantage and asset that concrete units have today, he declared. The clay association is preparing to investigate not only their own products, but also the concrete products in the hope that they may detect some flaw, Mr. Collins said, and so it is imperative that the quality be left up. A quality product can be made economically if all factors are closely watched, he said. On the other hand a salesman may spend three months selling a job, and one load of bad block will waste all his time.

As an example of the rapidly changing industry of today, Mr. Collins cited a case of where a Milwaukee manufacturer started making a light-colored block for foundation work, and before long he was getting all the business because the block afforded a lighter basement. At once the other manufacturers' block became obsolete and they were forced to make this light colored block.

Similarly lightweight block have largely superceded other block for superstructure, Mr. Collins said. These units might be of cinders, haydite, or some other form of light aggregate, but the result is the same. It is giving the industry a new momentum.

An interesting phase of the industry, is that outside capital is being attracted to it because of its basic characteristics, and bigger type men are now working out the destiny of this business than formerly.

Mr. Collins also suggested the need of paid secretaries to spread the word about concrete units to the public, in short to do nothing but make contacts with necessary people, so that the work of the salesmen will be aided when there is a job to be sold. Every association should have a full time man, he thought.

H. C. Shields, Lehigh Portland Cement

Co., presented a talk illustrated with lantern slides on "Merchandising Concrete Products." He called attention to the fact that the average workman had increased his productivity by one-third through the use of machines, and that this added production must be absorbed through better merchandising. The producer of today must be a fighter, but he must also be a student, or else his fighting will be of no value. Three things, Mr. Shields declared, shaped the destiny of any business—Mother Invention, Father Time, and Dame Fashion—and the producer must be able to anticipate all three and answer their arguments.

A producer should obtain a fair profit on what business he has, and develop new business. But volume alone will not solve the problem, if there is not a demand which will absorb the product at a reasonable profit.

The trend in the industry is well shown by the fact that the number of plants has dropped from 7000 to 4200, and yet the total output has increased, he said. That means less overhead, more efficient operation and the elimination of the weak and inefficient plants, he declared.

Aggressive Competition

Mr. Shields called attention to the fact that competitive building materials associations are to spend $9,500,00 for advertising. The potential prospects of the cement products manufacturer will read those advertisements, he said, and that meant the products industry could not afford to sit and do nothing. Yet this should not have a discouraging affect, he told his listeners, but instead it should teach them that the day is past when they can sit in their offices and wait for orders.

He said that the products industry had gone through the pioneer period of growing up, and had passed the level period of old competition, and was now at the beginning of the period of new and stronger competition. Whether the industry would go on up to success or slide back to failure depended on the co-operative efforts of the industry as a whole, he declared.

In closing he called attention to the fundamental character of the products industry. The three elements of American prosperity, he said, were adequate food, clothing and shelter, and of these three only the last named was permanent in its character. Thus the products industry, supplying certain necessities for shelter is firmly founded, basic, and permanent, he said.

Lightweight Aggregates

E. W. Dienhart, of the haydite department of the Hydraulic Press Brick Co., gave a talk on "What Lightweight Aggregates Mean to the Future of the Concrete Products Industry." He said that first he wanted to call attention to two prime requisites that the industry must consider. The first was to see than the building industry as a whole got as much of the consumer's dollar as was possible, and the second was to see that the products industry attracted as large a portion of the building dollar as could be obtained. He cited, as an example of the competition that must be met, the fact that the desire for an automobile is replacing the desire for a home today.

In speaking of the necessity of the concrete products industry to get out of the foundation business and to get into above-grade construction work, Mr. Dienhart paid a tribute to F. J. Straub, who, he said, had seen the necessity of the light-weight unit for superstructure work and had gone ahead in developing its manufacture. This earlier development was in cinder block, but since then manufacturers have realized the need, and other types of aggregate have come in. Through the use of these aggregates the industry has gotten around some of the problems which affected the old types. An interesting slant on this lightweight block proposition is that clay products manufacturers are coming to realize that these units are worth while and are beginning to manufacture them. An example is Mr. Dienhart's own company which operates a number of clay brick plants, but also manufactures haydite concrete units. The industry has been carried along on the general wave of building in the past ten years, Mr. Dienhart declared, but that wave is not increasing in size, and from now on the products will have to be sold on sheer merit and good merchandising. Because of this the lightweight unit has a great field in the products industry, and will do much to aid the continued development of the industry.

Mr. Dienhart was asked how the weight of haydite block would compare with that of ordinary block. He replied that for 8x8x16-in. block the haydite would weigh 25 to 30 lb., while the same type of sand and gravel block would weigh 44 to 52 lb. In answer to a question as to what percentage of fine and coarse aggregate was used in haydite block, he said that his company's block were made with approximately 40% fine haydite and 60% coarse haydite. With this mix, he stated, capilliarity is reduced to such an extent that water will not be drawn through the block, although, he said, that it was not practicable to try to eliminate the capilliarity entirely.

Efficiency in the Plant

C. S. DeLamater, sales director for the Consolidated Concrete Machinery Co., spoke on "What Price Efficiency." His theme was a discussion of the extent to which it would be practical to expend money to bring about more efficient operation in present or proposed plants. He mentioned the older plants where a careful analysis of the requirements had not been entered into before construction began, and in which, therefore, there is much lost motion. Some of this may be in the use of unnecessary machinery, some may be because the materials or the products are moved about more than is necessary, or some of the waste may be from other sources. But generally speaking, the solution is in simplifying the operation and not in added more complication to it.

What price should we pay for future expansion, Mr. DeLamater asked. A thoroughly planned plant with provisions for future expansion will cost more at first but will pay for itself when expansion is necessary, he said. A study should be made to see if the future market will warrant expansion, and if it will, provision should be made for it. Storage bins should be made adequate, the plant should be placed at one side of the property where it is possible to expand naturally, and even the location of the original machine or machines in the plant should be considered with an eye toward future installation of more units. This may cost more money at first but it is paying for the future efficiency.

Advises Large Inventory

One point of particular interest was brought out by Mr. DeLamater. This was that it was better to carry a large inventory, or supply of block, over from slack seasons to help at the peak load times. Many producers feel that this is unprofitable as it requires an invested capital on which there is no return for several months. Mr. DeLamater pointed out that block are usually made cheaper in the off periods than in the rush periods, especially if overtime is required during the latter period. This saving almost invariably balances the return which might be expected from capital were it not tied up in block in the yard. Further the block which are in the yard are actually better because of the curing, and because block made in a rush are apt to be not quite up to standard. Add to this the fact that with a good supply on hand there is no danger of disappointing a customer through non-delivery, and it is evident that the large inventory or supply system is the best.

Mr. DeLamater urged the producers to cooperate with the national association in every way possible, and to make it a sort of a clearing house for ideas. Organized effort through the association would be of inestimable value to the industry, he concluded.

Merchandising Cement Products

Three short papers were delivered by three producers from widely separated parts of the country on "How we merchandise our products." The paper of ***J. A. Livingston,*** of Toronto, Canada, was first presented by Mr. Henderson, president of the Canadian products association. Mr. Livingston was not able to attend the convention due to illness. The paper first called attention to the problem encountered by the Canadian producers in regard to the sizes of units different from those found in the United States manufacturers. It stated that 4, 8, 9, 12 and 13¼-in. block had to be made and kept on hand for the Canadian trade, and, more than that, all these sizes must be produced plain, rock-faced and granite-faced. It is easy to see what an enormous supply this

would require to be carried.

In selling the units, Mr. Livingston's paper stated, the company had a triple motto: First, the quality must always be kept up. Second, the service rendered by the company must be the best. And third, there must be one price to all. With these three ideas the company has sold a million block annually, using three salesmen always on the job. The selling that these men do always depends on the plant. If, as in this case, the company can supply a good product at the time it is wanted, the salesmen can feel secure in going out.

All-Year Sales

Mr. Livingston's paper noted that whereas formerly there were distinct selling seasons, now the production is very well spread over the whole year. Another change has been in the increased selling of blocks for larger structures, notably apartment houses. He warned, however, against the incautious builder who goes ahead with such buildings without the proper finances, only to have the whole work stopped because of a lien on the property, resulting in loss to everyone including the products manufacturer who supplied the block.

As an advertising suggestion, the paper told of a local competition for a slogan advertising the company's product. This had the double purpose of obtaining a useful slogan and of awakening the interest of the people in the products of the company. Some of the best slogans submitted were: "They Stood the Test," "Built Not for a Day, But for All Time," and "I've Tried the Rest, Now I'll Use the Best."

Austin Crabbs, Davenport, Iowa, vice-president of the association, presented the second paper of the three, and he called his "Sales in a small community." He called attention to the fact that the competitive nature of the industry has made it a business of mass production on small profit per unit. For this reason the plant in the small community, where the market is limited, and also the plant in the large community, where there is considerable competition, must operate efficiently. The matter is being worked out by the process of elimination, but this is a real economic waste, he told the convention.

One solution for the manufacturer who finds himself in this position, Mr. Crabbs said, is to develop allied side-lines to help bear the overhead. Such side-lines would well be other masonry materials, and, in fact, all types of building materials. However, it must be remembered that if there is no opening for such a business in the community, no amount of stocking of these side-lines will help the situation. If there is an opportunity, then it is a good thing to get into allied business, as frequently products jobs may be sold on the ability to render service on other materials.

A. G. Swanson, of Omaha, Nebr., secretary of the association was the last speaker of the session. He presented a number of cardinal points of his selling campaign, some of which had not been mentioned by previous speakers. He said that one of the biggest sales arguments possible was the use of actual photographs of structures in which the company's units had been used. He suggested that subscriptions to all papers that would tell about local future building projects were valuable for obtaining names of prospects for the salesmen. The company emphasizes quality and is actively engaged in missionary work with architects and builders to convince them of the quality and utility of concrete units.

Mr. Swanson declared that the Omaha industry is finally getting above grade. He said that orders in some larger buildings for above-grade blocks had been an opening wedge toward this end.

The "Concrete for Permanence" advertising of the Portland Cement Association has been a great aid in selling, Mr. Swanson said. But merchandising requires continuous efforts, he said. There are always a few repeat orders, but, as a general rule, each order must be fought for individually.

Mr. Swanson concluded with the statement that the industry in the Omaha district had been pretty well sold on the policy of "no discounts." Discounts, he said, tend toward an eventual reduction in prices, and a consequent disruption of the industry.

Convention Banquet

Not the least important event of the National Concrete Products Association convention was the banquet held at the Book-Cadillac on the evening of the 11th. Practically all of the producers showed up, (possibly because it was known that there would be no after dinner speeches) and it was a real get-together. The features of the program was the entertainment generously supplied by the Consolidated Concrete Machinery Co., of Adrian, Mich. At the close of the evening several old-timers, including "Bill" Allen were called on for extemporaneous speeches.

Officers for 1929

The officers selected to run the association for 1929 are the same that were in office during the past year. This is undoubtedly a compliment to the work these men have accomplished during 1928 toward building up a greater association. The officers include Newton D. Benson, Providence, R. I., president; D. R. Collins, Milwaukee, Wis., first vice-president; Austin Crabbs, Davenport, Iowa, second vice-president; and A. G. Swanson, Omaha, Neb., secretary-treasurer.

Decision on "Straub" Cinder Block Patents Again Appealed

THE SUPREME COURT of the United States has been asked to consider the question of whether concrete building blocks having a cinder base and having the added feature of "nailability" are original and new so as to support a patent issued on them by the Patent Office. This question arises in the cases of Thomas Graham et al. v. Crozier Straub, Inc., and Concrete Specialties Co., No. 654, Jacob Melmod et al. v. Same, No. 655, and Robert G. Downer v. Same, No. 656.

The petitioners have just filed petitions for writs of certiorari and are seeking to have the respondent's patent declared invalid. They state in their petition that there are 44 suits now pending in the United States District Courts in Pennsylvania and New Jersey in which the respondent seeks to enjoin alleged infringement of patent rights.

The patent in question, the brief states, was issued to the respondent, January 16, 1917, for a cinder concrete building block and methods of making the same. Concrete is made by mixing cement and water with an inert material, called the aggregate, it is explained. Sand, crushed stone, slag, cinders, burned clay and a great many other materials are used for the aggregate, so that the patentee's block cannot be supported alone on the fact that he used an entire cinder aggregate and used no sand at all, the brief states.

The patent is sought to be upheld, the brief declares, on the ground of its "nailability," or the quality of receiving and holding a nail, but "nailability" is now admitted to be old and has been proven to have existed many years before the patentee secured his patent.

The District Court of New Jersey found the patents to be invalid. Upon appeal, the Circuit Court of Appeals for the Third Circuit found the patent valid and infringed.

The court says, in effect, that all persons working in cinder concrete, a material known for 50 years, infringe because their product has the inherent and well-known characteristic of nailability, the brief contends, and it is the contention of the petitioners that the decree of the Circuit Court of Appeals should be reversed and the patent be declared invalid.

Freight Committee Permits L.C.L Shipments of Rock Products in Paper Bags

THE Consolidated Freight Classification Committee has granted certain past applications that will allow the shipment in multi-wall bags of cement lime, plaster, powdered limestone, mortar colors, and similar commodities, when shipped in less-than-carload quantities as well as in carload lots. Many of these commodities were previously permitted to be shipped in paper bags in carload lots, but in some instances the ruling will be new for both carload and L.C.L. shipments. The new classification, which was published as Supplement 18 to the Consolidated Freight Classification No. 5, I. C. C.-49, became effective on the first of February.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Md.	.50– .75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Springs, W. Va.	.40	1.25	1.25	1.25	1.15	1.15
Munns, N. Y.	.75	1.25	1.25	1.15	1.00	.....
Prospect, N. Y.	.80	1.15	1.15	1.15	1.15	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.65	1.35	1.25	1.00	.95	.90
Syracuse, N. Y.	.50	.....	1.00	1.00	1.00	1.00
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
West Chester, Penn.	5.00g	.....	.....	.....	.....	4.00k
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.....	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Cypress, Ill.	.90–1.15	.90–1.15	1.00–1.15	1.00–1.20	1.00–1.15	1.00--
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.95	1.10	.....	1.10	1.10	.....
Stolle and Falling Springs, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Greencastle, Ind.	1.25	1.05	1.05	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90–1.00	1.00–1.10	.90–1.00	.85– .90	.85– .90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	.....	1.10	1.05	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90–1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.90	.90	.90	.90	.90	.....
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	.....
Chico and Bridgeport, Tex.	.50–1.00	1.10–1.30	1.20–1.30	1.10–1.20	1.00–1.10	.95–1.10
Cutler, Fla.	.60r	.....	.....	1.75r	1.10r	.....
El Paso, Texas	.50– .75	1.00–1.25	1.00–1.25	1.00	1.00	1.00
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35e	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.00	1.25	1.25	.90–1.25	.90–1.25	.90–1.25

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.60	1.35	1.25	1.25–2.00
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.40–1.45	1.40–2.20	1.60–2.00	1.40–1.60	1.40–1.60	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	.....
Toronto, Canada	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.....	.....	1.75	1.75	1.60	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	.....	2.35	.....	.....	.....
Lithonia, Ga.—Granite	.75a	1.75b	1.75	1.35	1.25	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	.....	.....	1.50 to 1.85	.....	.....	.....
Toccoa, Ga.	1.40	1.40	1.35	1.30	1.25	1.20

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.50. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carloads prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$	7.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—Analysis, 94.89% $CaCO_3$; 1.5% $MgCO_3$; 50% thru 100 mesh	3.50–5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50 mesh	2.00
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 95% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh	1.00
Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk	3.50
Paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25 cash 15 days)	
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton	6.00
90% thru 20 mesh, bulk, per ton	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk	2.70
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.00–4.50
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35–1.60
Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 101.12%; 99% thru 10, 60% thru 50; 45% thru 100	2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk	3.50
100% thru 4, 30% thru 100, bulk	1.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y.—Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk	2.75

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%. $MgCO_3$; 90% thru 10 mesh	1.50
30% thru 100 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh 1.00–1.25

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton 1.25
90% thru 4 mesh, per ton 1.10

Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; crusher run rescreened .... .85

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00

Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 50% thru 50 mesh 1.50

Kansas City, Mo.—50% thru 100 mesh 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .90

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.10–1.70

Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh 2.35

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh 1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks 6.00

Hillsville, Penn., sacks, 4.50; bulk 3.00

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra) 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio, sacks, 4.50-5.00; bulk 3.00–3.50

Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. *1.75–2.25
Estill Springs and Sewanee, Tenn. 1.50
Franklin, Penn. 2.00
Klondike, Mo. 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .30– .35
Ohlton, Ohio 2.50
Ottawa, Ill. 1.25
Red Wing, Minn. 1.50
Rockwood, Mich. 2.25–3.00
San Francisco, Calif. 4.00–5.00
Silica and Mendota, Va. 2.00–2.50
St. Louis, Mo. 2.00
Utica and Ottawa, Ill. 75–1.00
Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio	.....	1.50
Dresden, Ohio	.....	1.25
Eau Claire, Wis.	4.30	.....
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.	.....	1.75
Massillon, Ohio	.....	2.00
Michigan City, Ind.	.....	.30
Montoursville, Penn.	.....	1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.	.....	1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.	.....	1.75

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.....	.55	1.15	1.50	1.40	.....
Attica and Franklinville, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00
Boston, Mass.†	1.40	1.40	2.25	.....	2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.60	.85	.....	.....	1.25	.....
Leeds Junction, Me.	.....	.50	1.75	.....	1.25	1.00
Machias Jct., N. Y.	1.00	1.00	1.00	.....	1.00	1.00
Milton, N. H.	.....	.50	.....	.....	.....	.90
Montoursville, Penn.	1.00	.80	.60	.60	.50	.50
Northern New Jersey	.50– .60	.50– .60	.....	1.25	1.25	.....
Somerset, Penn.	.....	2.00	.....	.....	.....	.....
South Portland, Me.	.....	1.25	2.75	.....	.....	2.25
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*	.....	.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75	.....	1.75
Washington, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Attica, Ind.			All sizes .75–.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.	.....	.40s	.....	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90n
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio	.....	.60	.50	.60	.60	.....
Des Moines, Iowa	.....	.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.....	.55	.70	1.00	1.00	.....
Elkhart Lake, Wis.	.....	.45	.50	.70	.70	.60
Ferrysburg, Mich.	.....	.50– .80	.60–1.00	.60–1.00	.....	.50–1.25
Grand Haven, Mich.	.....	.60	.....	.90	.....	.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio	.....	1.00	1.00	.....	1.00	.....
Hersey, Mich.	.....	.50	.....	.....	.....	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60	.....	.90	.75–1.00	.75–1.00
Mankato, Minn.	.....	.45g	.....	.60–1.25h	.70–1.25	1.25c
Mason City, Iowa	.50	.50	.80	1.25	1.25	1.25
Mattoon, Ill.			.75–.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.35	.35	1.25	1.25	1.25	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55a	1.55	1.55	1.65
St. Louis, Mo.	.....	.....	†1.45t	†1.45u	†1.65v	†1.65
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.....	.75	.75	.75	.75	.75
Waukesha, Wis.	.....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.40– .50	.....	.....	.....	.....	.....
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.	.....	.45– .50	.....	.....	.....	.....
Ft. Worth, Texas	1.00	1.00	1.10	1.10	1.10	1.10
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00	.....	1.30	1.10	.90
Roseland, La.	.30	.30	1.00	.80	.80	.80
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75	.....	.....	.....	.....
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Oregon City, Ore.			All grades range from 1.00 to 1.25 per cu. yd.			
Otay, Calif.	.....	.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60	.....	.125	.....	1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.	.....	.....	.40	.....	.....	.....
Brookhaven, Miss.	.....	.....	.....	.....	.....	.60
Buffalo, N. Y.	1.10	.95	.....	.85	.....	.85
Burnside, Conn.	.....	.75*	.....	.....	.....	.....
Chicago, Ill.	1.25m	.....	.....	.35	.....	.....
Des Moines, Iowa	.....	.75	.....	.....	.....	.....
Dresden, Ohio	.....	.....	.....	.70	.65	.....
Eau Claire, Chippewa Falls, Wis.	.....	.....	.....	.....	.65	.....
Fort Worth, Texas	.....	.....	.....	.....	.....	.60r
Gainesville, Tex.	.....	.....	.....	.....	.55	.....
Grand Rapids, Mich.	.....	.....	.....	.50	.....	.....
Hamilton, Ohio	.....	.....	.....	.....	1.00	.....
Hersey, Mich.	.....	.....	.....	.50	.....	.....
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35	.....	.....	.....	.....	.....
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.	.....	.....	.....	.60	.60	.60
Somerset, Penn.	.....	1.85–2.00	.....	1.50–1.75	.....	.....
Steilacoom, Wash.	.25	.....	.....	.....	.....	.....
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.....	.....	.....	.....	.....	.60
York, Penn.	1.10	1.00	.....	.....	.....	.....

*Cubic yd. †Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¼-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in. (j) Lake sand, 1.75, delivered. (k) 60-70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.75	2.75				
Beach City, Ohio	1.75	1.75		1.50	1.50		
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00–1.25			
Eau Claire, Wis.						2.50–3.00	
Elco and Murphysboro, Ill.	Water-floated ground silica per ton in carloads—18.00–31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75–2.25	1.50–1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.50	2.50	2.00	2.50	2.50		
Michigan City, Ind.				.30–.35			
Montoursville, Penn.				1.35–1.50			
New Lexington, Ohio	2.25	2.00					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25	2.25	2.25	2.25	1.25	3.50	2.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.			Potters sand, 8.00–10.00g				
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1¼ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.00	1.25		1.25			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	1.45*
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅛ in. to 10 mesh, $1.25*; ⅛ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[8]
CENTRAL:								
Afton, Mich.						10.00	7.50	
Carey, Ohio	11.50	7.50	7.50		8.00		8.00	1.50
Cold Springs, Ohio		7.50	7.50					
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[16]
Scioto, Ohio	11.50	7.50	7.50	8.50	8.00	1.25	7.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[8]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50			7.50	1.35
Keystone, Ala.		9.00	8.00	9.00	9.00	11.00	7.50	1.35
Knoxville, Tenn.	19.00	9.00	9.00	9.00			7.50	1.35
Ocala, Fla.		11.50	10.50	12.00				1.50[20]
WESTERN:								
Kirtland, N. M.							15.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.50	17.50	12.70	17.50–19.00	13.00[19]	.90[17]	13.00[19]	1.85[17]
Tehachapi, Calif.[13]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] to 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] Also 14.50. [22] To 9.00. [23] Per bbl., 2.15. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Ground talc (20-50 mesh), bags 7.00–8.50
- Ground talc (150-200 mesh), bags 7.25–15.00
- Pencils and steel crayons, gross, 5-in., .80–1.75; 4-in. .50–1.25

Chester, Vt.:
- Ground talc (150-200 mesh), paper bags 7.00–8.00
- Same, including 50-lb. bags 8.00–9.00

Chicago and Joliet, Ill.:
- Ground (150-200 mesh), bags 30.00

Conowingo, Md.:
- Crude talc, bulk 4.00
- Ground talc (150-200 mesh), in bags 14.00
- Cubes, blanks, per lb. .10

Dalton, Ga.:
- Crude talc (for grinding) 4.00
- Ground talc (150-200 mesh), bags 9.00
- Pencils and steel worker's crayons, per gross 1.00–2.00

Emeryville, N. Y.:
- (Double air floated) including bags: 325–350 mesh 14.75–16.00

Hailesboro, N. Y.:
- Ground talc (300-350 mesh) in 200-lb. bags 15.50–20.00

Henry, Va.:
- Crude (mine run) 3.50–4.50
- Ground talc (150-200 mesh), bags 8.75–14.00

Joliet, Ill.:
- Ground talc (200 mesh) in bags:
- California white 30.00
- Southern white 20.00
- Illinois talc 10.00
- Crude talc 3.75

Keeler, Calif.:
- Ground (200-300 mesh), bags 20.00–30.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), bags 12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50–4.50
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00–4.50
Mt. Pleasant, Tenn.—B.P.L., 77%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00–9.00

Ground Rock
(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	3.50
B.P.L. 72%	4.50
Mt. Pleasant, Tenn.—Lime phosphate: B.P.L., 73%, 98% thru 100 mesh, 90% thru 200 mesh, 80% thru 300 mesh	11.20
B.P.L. 72%	5.00–5.50
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)
(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50–24.00
Roofing mica	37.50
Punch mica, per lb.	.12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, and American Botticino, coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar		b9.00–‖12.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.—Royal green	16.00–18.00a	
Harrisonburg, Va. — Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash		11.00–18.00
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white		†9.00–‖10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50– 7.50
Phillipsburg, N. J.—Royal green granite		16.00–18.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		¶7.90–‖8.95
Wauwatosa, Wis.		20.00–32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.		*10.00

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In 100-lb. bags, car lots, min. car 20 tons. * Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh	19.00
Buckingham, Ore. — White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y. — Color, white; analysis, K_2O, 9.63%; Na_2O, 1.01%; SiO_2, 69.72%; Fe_2O_3, .00%; Al_2O_3, 18.6% (crude); bulk, per ton	9.00
East Hartford, Conn. — Color, white, 40 mesh to 200 mesh	15.00–28.00
East Liverpool, Ohio — Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk	11.00–12.50
Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk	15.75–22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground. bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk (Bags 15c extra.)	18.00
Crude feldspar, bulk	10.00
Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Colo, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50– 8.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Texas	10.00–12.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks: Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags. (a) F.o.b. Middlebury, Vt.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Anaheim, Calif.	10.50–11.00
Barton, Wis.	10.50g
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	j13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00–19.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.50
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50–15.00*
Pontiac, Mich.	11.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.00–14.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	10.00
Syracuse, N. Y.	13.00–14.00
Toronto, Canada (f)	15.00†e
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (e) Delivered. (f) F.o.b. yard, 12.50. (g) Delivered Milwaukee, 13.00. (h) Also 15.50. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.		2.36	3.51¶
Baltimore, Md.		2.26–2.65	3.55¶
Birmingham, Ala.		2.00	3.44¶
Boston, Mass. (g)	.68¼	2.23–2.73e	3.27¶
Buffalo, N. Y. (h)	.62½	2.00–2.50	3.40¶
Butte, Mont.	.90¼	3.61	
Cedar Rapids, Iowa		2.24	
Charleston, S. C.		2.25–2.65d	3.58¶
Cheyenne, Wyo.	.64	2.56	
Chicago, Ill.		2.05–2.45	3.35¶
Cincinnati, Ohio		2.22–2.62	3.52¶
Cleveland, Ohio		2.24–2.64	3.54¶
Columbus, Ohio		2.22–2.62	3.52¶
Dallas, Texas		1.80	3.39¶
Davenport, Iowa		2.24	
Dayton, Ohio		2.22–2.64	3.54¶
Denver, Colo.	.63¾	2.55	
Des Moines, Iowa		2.14	
Detroit, Mich.		1.95–2.35	3.25¶
Duluth, Minn.		2.04	
Houston, Texas		1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09–2.49	3.39¶
Jackson, Miss.		2.04–2.44	3.54¶
Jacksonville, Fla.		2.60b	3.79¶
Jersey City, N. J.		2.13–2.53	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.62½	2.50	
Louisville, Ky.	.55½	2.57	3.47¶
Memphis, Tenn.		2.04–2.44	3.34¶
Milwaukee, Wis.		2.20–2.60	3.50¶
Minneapolis, Minn.		2.12–2.22	
Montreal, Que.		1.60	
New Orleans, La.	.45½	1.82	3.61¶
New York, N. Y.	.60¾	1.93–2.43	3.33¶
Norfolk, Va.		1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.		2.22	
Philadelphia, Penn.		2.11–2.21	3.51¶
Phoenix, Ariz.		3.91*	
Pittsburgh, Penn.		2.05–2.44	3.34¶
Portland, Ore.‡		2.40–2.90a	
Reno, Nev.‡		3.41a	
Richmond, Va.		2.32–2.72	3.62¶
Salt Lake City, Utah	.70¼	2.81	
San Francisco, Calif.‡		2.71a	
Savannah, Ga.		2.60c	3.65¶
St. Louis, Mo.	.48¾	1.95–2.35	f3.25¶
St. Paul, Minn.		2.12–2.22	
Seattle, Wash.		2.50–2.65j	f3.50†
Tampa, Fla.		2.40	4.11¶
Toledo, Ohio		2.20–2.60	3.50¶
Topeka, Kans.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.		2.12–2.52	
Winston-Salem, N. C.		2.29–2.69	3.59¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

Albany, N. Y.	.43¾	1.75	
Bellingham, Wash.		2.10	
Buffington, Ind.		1.80	
Chattanooga. Tenn.		2.45*	
Concrete, Wash.		2.35	
Davenport, Calif.		2.05	
Hannibal, Mo.		1.90	
Hudson, N. Y.		1.75	
Leeds, Ala.		1.65	
Lime and Oswego, Ore.		2.50‡	
Mildred, Kan.		2.35	
Nazareth, Penn.		2.15	
Northampton, Penn.		1.75	
Richard City, Tenn.		2.05	
Steelton, Minn.		1.85	
Toledo, Ohio		2.20	
Universal, Penn.		1.80	

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 24c bbl. refund for paid freight bill. (c) 35c bbl. refund for paid freight bill. (d) 40c bbl. refund for paid freight bill. (e) 45c bbl. foreign refund. (f) "Velo" cement, including cost of paper bag. ¶ "Incor" Perfected prices per bbl. packed in paper sacks. (g) Also 2.33 per bbl. (h) Also 2.10 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.70	4.00	4.00	4.00	4.00	4.50						15.00	20.00
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u					11.70u			
Blue Rapids, Kan.	1.70	4.00					10.00					15.00	20.00
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50			13.50			
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.					14.30o	12.30m		m9.00–11.00o					
Delawanna, N. J.				4.50–5.00	13.10–14.00	5.00		7.25					25.00
Douglas, Ariz.			6.00	14.50	15.00		18.00		30.00				
Fort Dodge, Iowa	1.70	4.00	6.00	9.00	9.00	9.50				19.00		15.00	20.00
Grand Rapids, Mich.	2.65	4.00	6.00	6.00	9.00	9.00	17.65		22.75	19.00	12.00	15.00	18.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00		15.00	20.00–25.00
Los Angeles, Calif. (f)		7.50–9.50	7.50–9.50	8.50–10.00	9.00–11.00		9.00–11.00		29.00–34.00				
Medicine Lodge, Kan.	1.70	4.00							15.00			15.00	20.00
Oakfield, N. Y.	2.50			5.50	6.00	6.00		5.50				15.00	25.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00		20.00	30.00
Portland, Colo.				10.00									
San Francisco, Calif.			9.00	13.40	14.40		15.40						
Seattle, Wash.		10.00m	10.00m	13.00m			14.00		23.00				
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00					20.00d	25.00e	33.00

NOTE—Returnable bags. 10c each; paper bags, 1.00 per ton extra (not returnable. (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (e) ⅜x48x36 in.; (f) plasterboard 18c to 20c per yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail 35.00.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.	.....	5x8x12–55.00¶	.....
Chicago District‖	180.00–210.00a	230.00–260.00a	280.00–330.00a
Columbus, Ohio	13.00	.....	.....
Detroit, Mich.	.15– .17†	.....	.24–.26†
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	11.00*	.....	.....
Graettinger, Iowa	.18– .20	.....	.....
Indianapolis, Ind.	.10– .12a	.....	.....
Los Angeles, Calif.	4x8x12–5.00*	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18– .20	.....	.....
Tiskilwa, Ill.	.16– .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	.....
Chicago District "Haydite"	14.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	.....
Ensley, Ala. ("Slagtex")	12.50	.....
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	.....
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.	.....	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	15.50	.....
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened 200 mesh, $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue-black, bulk, $6.00 per ton; $6.50 in burlap bags, plus 10c per bag.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. mediums	9.50–11.25	.....	.....	.....	.....	.....
No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Albion mediums	8.00– 9.00	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—No. 1	8.50–11.25	.....	.....	.....	.....	.....
Medium	7.75– 9.00	.....	.....	.....	.....	.....
Artistique	.....	16.00	23.00	26.00	32.00	40.00
Fairhaven, Vt.—						
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	.....	.....	.....	.....
Pen Argyl, Penn. (Albion Bangor)						
No. 1 Clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Albion Bangor Mediums	8.00– 9.00	.....	.....	.....	.....	.....
Cathedral gray	10.50–12.50	18.00	25.00	29.00	39.00	48.00
No. 1 ribbon	8.00–8.50	18.00	22.00	26.00	36.00	46.00
Textural	15.00	24.00	30.00	36.00	48.00	60.00
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00
Detroit, Mich.—5x8x12, per M.	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60
Pasadena, Calif. (Stone Tile):	
3½x4x12, per 100	3.00
3½x6x12, per 100	4.00
3½x8x12, per 100	5.50
Tiskilwa, Ill.;	
8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M.	50.00
3½x8x12, per M.	60.00
Prairie du Chien, Wis.:	
5x8x12, per M.	82.00
5x4x12, per M.	46.00
5x8x6 (half-tile), per M.	41.00
5x8x10 (fractional), per M.	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Cement Building Tile

Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	14.00
8x 8x16, per 100	22.00
8x12x16, per 100	30.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M.	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M.	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M.	80.00

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

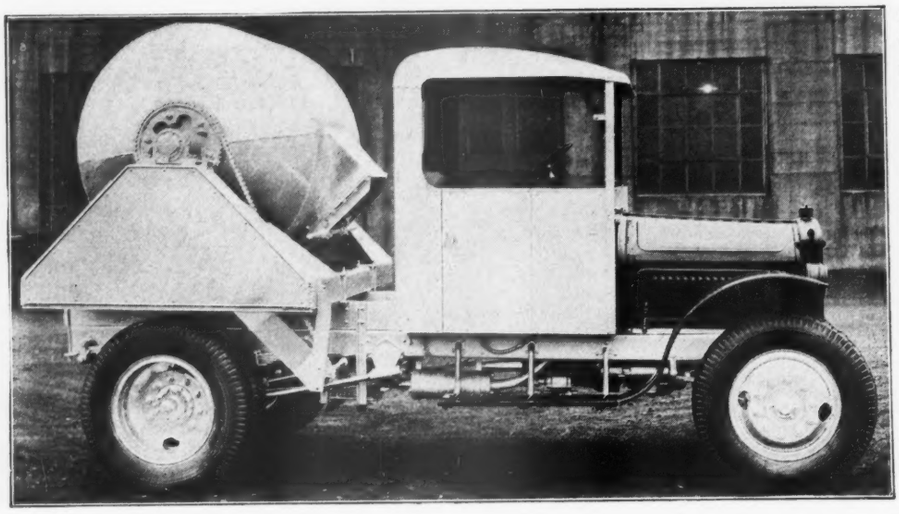
Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Longview, Wash.								Sewer pipe 40% off list; culvert—list									
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.								6 in. to 24 in., 18.00 per ton									
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.								12.00 per ton									
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	.70	1.55	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tacoma, Wash.	.15	.17	.22	.30	.40	.55	.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.90	.....	1.20	.....	.....	1.91	.....	2.60	3.60	4.35	5.93	6.8	7.70
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job; 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

New Machinery and Equipment



New style of truck for transporting concrete has transverse, rotating body

Rotating Body for Carrying Ready-Mixed Concrete

THE LeBlond-Schacht Truck Co., of Cincinnati, Ohio, are now producing an entirely new type of agitator body for transporting pre-mixed concrete from the plant to the job. This body is the development of Arthur C. Avril, president of Avril Tru-Batch Concrete, Inc., of Cincinnati, working with the LeBlond-Schacht Co.

The body is described as a rotating cylinder set crossways of the chassis, and driven by means of a chain from a worm speed-reducing unit through a specially-designed, ball bearing transmission take off. The body rotates on special self-aligning SKF roller bearings, and can be operated independentantly of the truck operation. It is filled and emptied through a 20x24-in. water-tight door, operated by a gear and ratchet mechanism with a hand crank. The capacity is two yards when loaded to about two-thirds full. It is necessary to leave the remaining space open so that the concrete will be agitated as the body revolves instead of moving as one solid mass.

It is claimed that concrete in the "Tru-Batch" body attains greater workability while in transit, thus permitting the use of a lower water cement ratio and thereby assuring the maximum strength attainable for any special mix. Among the advantage claimed for this new body are the following:

1—Simplicity in design and operation.

2—Rugged construction with light weight.

3—Perfect balance. The load is always on center of chassis, instead of being shifted from side to side as in other types.

4—No hoist required.

5—Only a small amount of power required.

6—Quick charging and discharging of load, due to the condition in which the concrete is delivered, reducing the contractors handling cost approximately 50%.

7—Increased strength of concrete because of additional mixing action. The flow of concrete can be metered to suit requirements.

8—Elimination of the need of using admixtures in concrete to increase workability and consequent cut in costs.

9—On road jobs the concrete can be spouted 7 ft. to the rear of truck, and hence the contractor can keep sub-grade in good condition.

10—A high speed, six cylinder truck on pneumatic tires.

11—Close coupled chassis—short turning radius.

This type of truck has been in operation at the plant of Avril Tru-Batch Concrete, Inc., and has established a record for efficiency and economy, according to the makers.

Tests have shown that concrete delivered at the job has actually attained a higher strength than concrete from the same batch sampled at the mixing plant. It is also stated that a cost of 16 cents per yd.-mile is a conservative estimate of the operating cost of a 2½-ton Schacht truck equipped with 2-yd. body. This includes the cost of the driver, gas, oil, tires, interest, depreciation, insurance, maintenance and incidentals. The speed of operation is shown by one record of work done in 8 working hours by this equipment. Delivery was made on 68 cu. yd. of concrete on a three mile round trip haul necessitating 34 loads of two yards each, for a total mileage of 102 miles in 8 hours. The average running time for the 3-mile round trip, including loading and unloading was only 14 minutes, and this included dumping at a location where the truck had only 19 ft. in which to turn around.

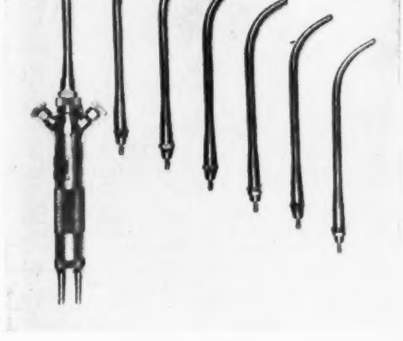
The truck on which the body is mounted is equipped with 6-cylinder Waukesha motor and is made on a 126-in. wheel base. The overall height of the truck and body is 102 in. without a load and the combined weight is 9100 lb.

The manufacturers claim an efficient and economical unit for hauling mixed concrete, combining a low initial cost with simplicity.

Light Welding Blowpipe

THE Oxweld Acetylene Company, of New York City, has announced a new, light weight welding blowpipe which was primarily designed for use in the construction of aircraft, but which is also well adapted to work of all kinds on light tubing or sheet metal. This blowpipe, which is designated as "Type W-15," is of the injector type and can be used on a low pressure supply.

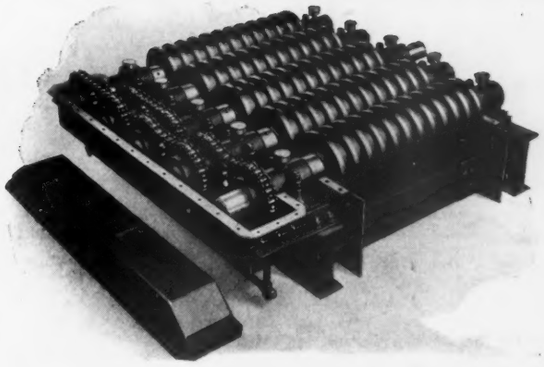
There are seven welding heads supplied with the blowpipe and these are equipped with drawn copper tips to withstand high temperatures. They are curved to reach with ease to the most inaccessible places. Each welding head is detachable as a unit and each injector can also be detached from the welding head. The various heads are all



New welding torches

designed for a constant oxygen pressure of 20 lb. per sq. in., making it possible to change heads without readjustment. Valves for adjustment of oxygen and acetylene pressures are placed on the handle in such a position that they can be operated by the thumb and forefinger of the hand holding the blowpipe, leaving the other hand free.

Multi-Roll Sizers

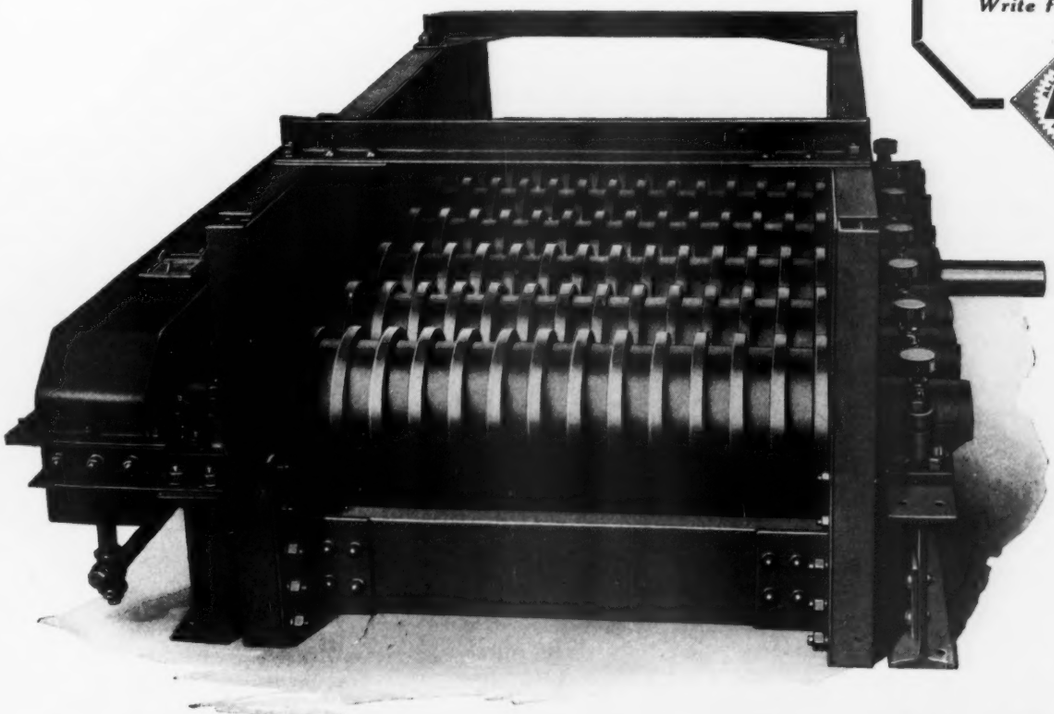


Multi-Roll Sizers for scalping and sizing, are built for screening many commercial sizes of materials. They are of heavy construction with structural steel frames. The driving mechanism is enclosed in a dust and oil tight housing. The shafts are mounted in large bearings with grease cup lubrication and are driven from a central shaft through roller chains. The chains operate in a bath of oil. All parts are readily accessible and easily removable. The Multi-Rolls operate at differential speeds giving a rapid segregation of the material and consequent high capacity with minimum power and maintenance. Multi-Roll Sizers are built in a wide range of sizes for capacities from 50 to 800 tons per hour.

A-C SERVICE

Allis-Chalmers products include complete equipment for crushing, screening and cement plants. Our Engineers are at your service to design and install a complete highly efficient plant, to extend your present plant or to help solve your crushing problems. The fact that motors, pumps, and power plant equipment are also built by Allis-Chalmers and adapted to this particular service affords the customer the unusual opportunity of obtaining all his required equipment under one contract and from one responsible manufacturer.

Write for Bulletins



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News of All the Industry

Incorporations

Elkton Concrete Products Co., Elkton, Md., $25,000.

Quarry Keystone Co., Palm Beach, Fla. J. L. Moore, Comean Bldg., Palm Beach.

Joseph W. Bartels Sand and Gravel Co., Dayton, Ohio. Offices, 43 Mayfair Rd.

Schuylkill Poultry Farm, Inc., Dover, Del., $25,000; to deal in stone, lime, brick, etc.

Gurba Trap Rock Corp., Wilmington, Del., 1,000,000 shares; to operate stone quarries.

Craftstone Corp. of America, Wilmington, Del.; to deal in silica sand, silicon and glass sand.

Hoosier Building Sand Co., Martinsville, Ind., filed papers changing location to Indianapolis, Ind.

Clinton River Cement Products Co., Wilmington, Del., $100,000; to deal in sand, cement, etc. F. A. Burns.

Hanover Sand and Gravel Co., Newark, N. J., 2500 shares, no par value. Wolber and Gilhooly, Newark.

O'Leary Concrete Co., Louisville, Ky., $2000. Louise C. O'Leary, Emmett O'Leary and Cornelius O'Leary, Jr.

Pinnacle Stone and Material Co., Little Rock, Ark., $10,000. J. E. McCook, Charles E. Moyer, J. C. Mattson and D. A. McRae.

Calaveras Cement Co., San Francisco, Calif., increased stock from $2,000,000 to $3,000,000; 120,000 to 180,000 shares, no par value.

Johnson Rock Co., Inc., Sacramento, Calif., $1,000,000; 3000 preferred and 7000 common shares, par value $100. J. E. Johnson, C. Hewitt and H. J. Peacock, directors.

San Diego Lime Products Co., San Diego, Cal., $1,500,000. Incorporated under the laws of Delaware at Wilmington, Del. To deal in lime, cement, bricks and tile.

The Collins Concrete Products Co., Hanover, Penn., $5000; 50 shares, par value $100. C. F. Morelock, treasurer, 233 Third St.; C. H. Varner, 128 High St., and M. C. Collins, Jackson St., Hanover.

Illinois Sand and Gravel Co., Chicago, Ill., decreased stock from $190,000 and 2000 shares no par value to 2000 shares no par value. Correspondent: Knapp and Campbell, 208 S. La Salle St., Chicago.

Chicago Hydro Stone Corp., Chicago, Ill., $10,000 preferred stock, 400 shares no par value. To manufacture and deal in cast stone and subsidiary products. E. Foran, Wm. G. Murray and L. A. McCormick. Correspondent: M. D. and Frank Goldberg, 100 N. La Salle St., Chicago.

Quarries

F. A. Jones Stone and Lime Co., Zanesville, Ohio, has been dissolved, according to a report received by George W. Sharp, secretary of state.

Trap Rock Co., Minneapolis, Minn., has filed plans for a new stone crushing plant which will be 54x60 ft. in size. John Wunder is general manager of the company and C. J. Bard of Minneapolis is the architect.

Wissota Sand and Gravel Co., Eau Claire, Wis., has recently erected a new building close to the railroad track below the depot at Durand, Wis., and will handle ground limestone therefrom. Joseph Weber will have charge of the business.

The Colorado and Southern Railway, according to G. H. Logan, assistant general freight agent, will expend approximately $150,000 in constructing a five-mile extension to its lines in Larimer county, Colo., if a permit asked of the Interstate Commerce Commission is granted. The extension is primarily intended to tap the rich limestone quarries in the territory.

Danville, Va. Bids were opened February 6 by the Public Works Committee of the City Council for the renting of the city farm and quarry for a period of not more than two years, in order that the industry, which is now idle, may be made to bring income to the city treasury. The Collins Granite Co. is known to be interested and is expected to bid on the project.

Sand and Gravel

Olean Sand and Gravel Corp., Olean, N. Y., according to a newspaper report, has been dissolved.

Construction Materials Co., South Bend, Ind., has filed papers changing the company's name to that of the Sensibar Sand Co.

Columbus Gravel Co., Columbus, Tex., is planning to build a new all-steel washing plant which will increase the company's output 50%. The new plant will be started shortly. The company reports a steady growth in its business for some time past. with a gross production of approximately 10,000 carloads in 1928.

Oreapolis, Neb. The pits near this city are preparing to open for their second season of operation about the first of March, following a shutdown since last November. While the plants in this new field only started operating in 1928, they had a good season, and expect to have even a better year in 1929, supplying material for road construction in Nebraska and Iowa, and for general building in Omaha.

Janesville Sand and Gravel Co., Janesville, Wis., did not find business as good in 1928 as in 1927, according to a report by G. F. Ehrlinger, secretary-treasurer of the company, in a Janesville paper. Overproduction in the industry was given as the reason for the slump. Mr. Ehrlinger stated that "last year Milwaukee and Chicago were way behind in the construction of apartment houses and other buildings. They have caught up now and the sand market must suffer."

Gypsum

Atlantic Gypsum Products Co., Boston, Mass., is operating the gypsum quarries and plant at Cheitcamp, Cape Breton, Nova Scotia. Due to a garbled newspaper account, it was erroneously stated in our issue of January 19 that the United States Gypsum Co., Chicago, was reported to have taken over this property.

Cement Products

Key City Brick and Tile Co., Port Townsend, Wash., has been organized by Tony De Leo, a local contractor. A small plant has been opened at the sand plant near the town and cement brick and cement tile equipment have been installed. Later Mr. De Leo expects to have a production of 2500 bricks daily.

Metropolitan Concrete Co., Cleveland, Ohio, has purchased the United Supplies Co., which operated nine asphalt plants valued at $1,000,000. The Metropolitan company has also effected a merger with the Trans-Mix Service Co., which was organized to handle transit mixers. The company will produce ready-mixed concrete under the trade name of "Metro-Myx."

Rib-Stone Concrete Corp., Le Roy, N. Y., is making extensive improvements and additions to its plant, including the installation of a new revolving kiln, 5x52 ft. in size, for drying the materials for use in the company's products. The kiln has a drying capacity of from 12 to 25 tons per hour, depending upon the dampness of the material. This installation is in line with the Rib-Stone corporation's policy of accurate and scientific production of concrete units.

Agricultural Limestone

Missouri's use of agricultural limestone, according to reports, has increased more than 1500% in eight years. As a result of work done by the Missouri College of Agriculture and its Extension Service, approximately 250,000 tons of pulverized native limestone were spread on the soils of Missouri during the last two years.

Cement

Peerless Egyptian Cement Co., Port Huron, Mich., has begun the expansion of its mill at that point. The improvements will cost about $125,000.

Ash Grove Lime and Portland Cement Co., Kansas City, Mo., is completing its new plant at Louisville, Neb., and according to newspaper reports will have an office at 15th and Harney Sts., Omaha, Neb.

Volunteer Portland Cement Co., Knoxville, Tenn., is reported to be contemplating the addition of a third unit during 1929, including a rotary kiln and auxiliary machinery to cost more than $400,000. Charles Lewis is the general manager.

Alpha Portland Cement Co., Easton, Penn., has completed its seasonal repair work at its Ironton, Ohio, plant and operations have been resumed. During the shutdown, the 567-ft. shaft to the mine was lined with solid concrete, in place of the old wood cribbing.

Oregon Portland Cement Co., Portland, Ore. has moved into its new office building at First and Madison streets, in Portland. The new building is a concrete structure of modernistic design, and is a demonstration of the usage of concrete for such construction. The building is featured with elaborate ornamentation which was all poured in place, instead of being pre-cast.

Pierre, S. D. A bill was recently introduced into the state legislature by Representative Lyon which would authorize the state legislature to sell the state cement plant at Rapid City, S. D. According to the bill, the purchaser would be required to operate the plant for at least ten years. The bill provides that if the sale is not completed by January 3, 1931, the state will continue to operate the plant.

Pennsylvania-Dixie Portland Cement Co., New York, N. Y., is intending to double the output of its plant at Clinchfield, Ga., starting February 15. The announcement of the increased output followed the visit of Blaine S. Smith, president of the company, to the Clinchfield plant recently. The reason for the continued operation of the Clinchfield plant after the Kingsport, Tenn., plant has been closed down is given as being because the former plant is much less expensive to operate due to the proximity of the materials to the plant.

Lime

Olympia, Wash. The state senate on February 14 passed a resolution to Congress requesting a duty on the importation of lime from British Columber. Senator Heifner, the lone Democratic member who voted against the bill, advocated a tariff on the finished rather than the raw product.

Miscellaneous Rock Products

Southern Amesite Asphalt Co., Birmingham, Ala., will construct an asphalt plant during the present year. George B. Carey, Louisville, Ky., is president of the company.

Interstate Amesite Co., Atlanta, Ga., according to reports, will erect a $15,000 asphalt mixing plant on the Atlanta, Birmingham and Coast Railroad near North Ave. Offices of the company are in the Atlanta Trust Bldg.

Personals

R. H. MacFetridge, superintendent of the Lehigh Portland Cement Co., Birmingham, Ala., at a recent meeting of the Tarrant City Commercial Club of that city was elected president for 1929.

Charles D. Brewer of the Duluth Crushed Stone Co., Duluth, Minn., was chosen vice-president of the Duluth Builders' Exchange at a recent meeting of the board of directors of that organization.

J. L. Tildsley, Jr., formerly with the American Cyanamid Co., is now identified with the Tar Products Division of International Combustion Tar

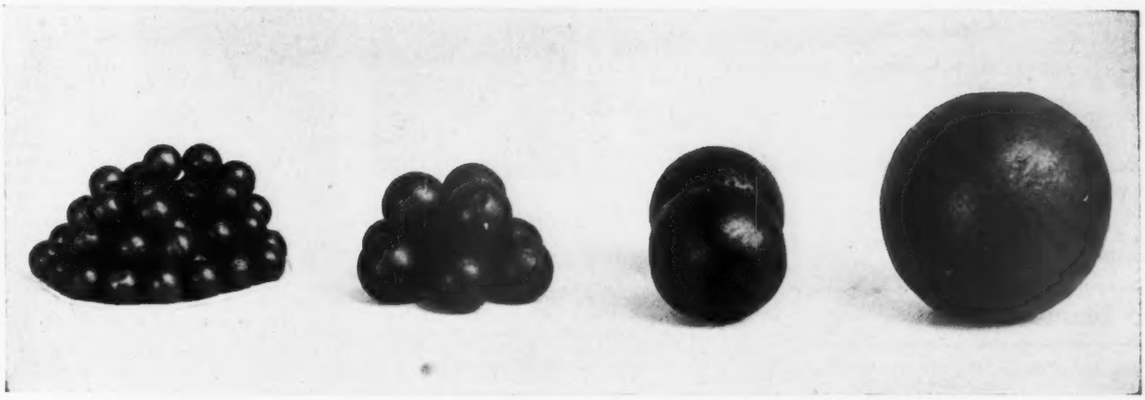
Lime Plant Profits—*Do you get your full share?*

FIFTY or sixty years ago there wasn't much thought given to production efficiency. A lime plant was a lime plant. But today we don't consider it as a mere "business"—it is a definite investment. For every thousand dollars invested, we expect a set annual dividend. And the largest possible return can never be realized unless every detail of plant construction and equipment co-ordinates into a single, profitable unit.

The building of such units has been the work of Arnold and Weigel for many years, and the completion of some of the countries' most efficient and "paying" lime plants proves the value of their experience. When planning to build either a new plant or additions, get in touch with an A & W engineer, or write for Bulletin 10 today.

ARNOLD & WEIGEL
WOODVILLE, OHIO, U.S.A.

COATES GRINDING MEDIA



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CARBEX Forged Steel Balls—7/8-in. to 5-in. diameter.
"TUNGSCO" Steel Grinding Nuggets—5/8-in. x 1-in. to 1 1/4-in. x 1 3/8-in.

Largest Manufacturer of Grinding Media Exclusively

COATES STEEL PRODUCTS COMPANY
GREENVILLE, ILL., U. S. A.

and Chemical Corp., a subsidiary company of the International Combustion Engineering Corp., at 200 Madison Ave., New York City.

L. J. Capen, Davenport, Iowa, vice-president and sales manager of the Davenport branch of the Dewey Portland Cement Co., has been made a director of the company.

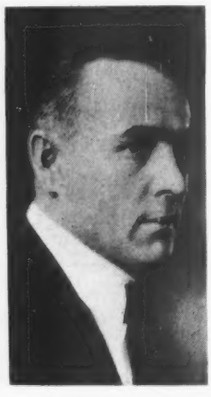
Barney Goode, who has been with Ingalls Stone Co., Bloomington, Ind., more than eight years, serving in nearly all of the departments, will become superintendent of the Alexander King Stone Co. quarry at Stinesville, Ind.

B. W. Druckenmiller, for the past sixteen years associated with the Crescent Portland Cement Co. of Wampum, Penn., is now connected with the Pennsylvania-Dixie Cement Corp., New York City, doing special sales work in marketing their products in different territories.

O. A. Hartley of Tampa, Fla., formerly superintendent of the Florida Portland Cement plant, left recently for La Paz, Bolivia, to take charge of the Cowham Engineering Co.'s mill there. Mr. Hartley will be succeeded as head of the Florida plant by C. E. Carom, who has been superintendent of the Cowham mill in Mildred, Kan.

John Jay and **H. F. Saxton** of the Iowa Manufacturing Co., and **T. M. Deal**, sales manager of the Speeder Machinery Corp., Cedar Rapids, Iowa, fooled Old Man Winter with his Iowa snow and below zero weather when they resorted to the use of an airplane to make a hurried trip to Cleveland from Cedar Rapids in order to be in attendance at the Dealers' Day Conference of the recent National Road Show. The trip was made in the six-passenger Stinton Detroiter owned by the Cedar Rapids Airways Co., and Dan F. Hunter, general manager of the airways company, acted as pilot.

Max A. Berns, publicity manager of the Universal Portland Cement Co., Chicago, was recently elected chairman of the Advertising Council of the Chicago Association of Commerce to succeed Homer J. Buckley. Mr. Berns, a graduate of the University of Illinois College of Engineering and for 15 years associated with the Universal company, is very active in the engineering and construction field, and has been identified with a number of outstanding movements in this connection. He is a member of the good roads committee of the Chicago Association of Commerce, was chairman last year of division 15 — contractors and building material —of the association, and is a member of the committee on advertising and publications of the Portland Cement Association.



Max A. Berns

Obituaries

William B. Sanders, a director of the Kelley Island Lime and Transport Co., died on January 25 at Boston. Judge Sanders was a member of the Cleveland bar and made his home in that city. He was in his 75th year.

Manufacturers

C. F. Pease Co., Chicago, Ill., has established a new Pacific Coast sales office at 501 S. Spring St., Los Angeles, Calif., under the direction of Ralph S. Gibson, sales manager for the Western territory.

Palmer-Bee Co., Detroit, Mich., announces the appointment of Ashley P. Peck as Chicago district sales representative with offices at 937 Monadnock Block, Chicago. Mr. Peck is a Purdue graduate in mechanical engineering and has had many years of experience in machinery merchandising.

Bethlehem Foundry and Machine Co., Bethlehem, Penn., at a meeting of the board of directors held January 22, elected the following officers: W. A. Wilbur, chairman of the board; J. George Lehman, president; Robt. E. Wilbur, first vice-president; G. Ernest Finck, treasurer, and I. E. Krause, secretary.

Pioneer Gravel Equipment Manufacturing Co.'s new factory is now under construction at 1529-1611 Central Ave., Minneapolis, Minn. The new building, according to announcements, cost $65,000 to build, and is expected to be completed within 60 days. It is the first unit in an expansive building program to be carried out by this new concern, which is headed by E. E. Ellertson, former president of the Russell Grader Mfg. Co. W. H. F. Thompson, secretary of the Imperial Machinery Co., is vice-president. According to Mr. Thompson, equipment dealing with road work will be manufactured.

H. O. Penn Machinery Co., Inc., New York City, announces that M. B. Rider, formerly New York sales manager for the T. L. Smith Co., has joined their organization as manager of their road building department, and will handle the sales of all road construction equipment for them.

Brown Instrument Co., Philadelphia, Penn., advise that their Buffalo, N. Y., office is now located at 402 Marine Trust Bldg., having recently moved from 624 Ellicott Square. O. B. Wilson, who has been with the company for over five years, has been placed in charge of the office at 819 Hippodrome Bldg.

Barber-Greene Co., Aurora, Ill., recently opened a new office in Cedar Rapids, Iowa, at 527-528 Merchants National Bank Bldg., under the supervision of Jack Marson. Another branch office at 1106 Nicholas St., Omaha, Neb., was opened at the same time by W. E. Toole, under the direction of Mr. Marson.

Cutler-Hammer, Inc., Milwaukee, Wis., announce that they have acquired the business of the Trumbull Vanderpoel Electric Manufacturing Co., of Bantam, Conn., which will be operated as a subsidiary under its present name. This purchase will add a complete line of meter service and safety switches to the present Cutler-Hammer line of motor control, wiring devices and allied electrical items.

The Prest-O-Lite Co., New York City, commenced operations recently at their new acetylene plant at 1241 North McLean Boulevard, Memphis, Tenn. This plant, which is the thirty-sixth of the Prest-O-Lite chain, will supply nearby industries with dissolved acetylene for oxy-acetylene welding and cutting. J. Brown is superintendent of the new plant, and C. A. Anderson, with headquarters at Birmingham, is district superintendent.

Trackson Co., Milwaukee, Wis., has completed arrangements with the Thorman W. Roshott Co., 928 S. Fourth St., Minneapolis, Minn., for the distribution of Trackson tractor equipment for the McCormick-Deering industrial tractor. The new distributors will handle the territories which are covered by the following branches of the International Harvester Co.; Fargo and Grand Forks, N. D.; Winona, St. Cloud, Minneapolis and Mankato, Minn., and Eau Claire, Wis.

Harbison-Walker Refractories Co., Pittsburgh, Penn., has appointed J. Spotts McDowell, who has been connected with the company for some twenty years, as director of research. Mr. McDowell is well known to the refractories and allied industries through his contributions to technical literature and his activities in the American Ceramic Society, the American Society for Testing Materials, American Refractories Institute, etc. He is a graduate of the Massachusetts Institute of Technology in mining engineering.

J. Spotts McDowell

Speeder Machinery Corp., Cedar Rapids, Iowa, held its annual Dealers' Day Conference, attended by Speeder dealers from all parts of the U. S. and Canada in the company's general offices on January 19. The trip to the factory from the Cleveland Road Show by the dealers was made in a special Pullman chartered by the company. The Dealers' Day Conference was followed by the annual sales convention, attended by all Speeder sales representatives.

Kentucky Wagon Manufacturing Co., Louisville, Ky., according to reports in the *Lousiville Times* and *Herald-Post*, has recently closed contracts for more than $40,000,000 worth of business with five European governments, and preparations for the manufacture of the products are now well under way. According to the statement of Robert V. Board, president of the company, who recently returned from an extended trip in European countries, at which time the negotiations were made, contracts are sufficiently large to keep the company's plant busy for several years, and all material will be assembled and the products made up at the Louisville plant.

Pittsburgh-Des Moines Steel Co., Pittsburgh, Penn., announce the following changes in their organization: J. E. O'Leary, who has been in charge of sales at the New York office, has been promoted to general sales manager, and assumed his new duties at the home office in Pittsburgh, February 1. H. W. Ford succeeds Mr. O'Leary as manager of the New York office. G. A. Smith will direct the construction activities of the company. W. E. R. Moore, formerly with the American Locomotive Co., has been engaged as export manager and the export department will be located in the New York office, 50 Church St., New York City.

The American Hoist and Derrick Co., St. Paul, Minn., has opened a branch office at 139 Townsend St., San Francisco, Calif., in charge of Boyd Nixon. The establishment of this branch office terminated a connection with Harron, Rickard and McCone, who handled the company's line in San Francisco and vicinity for a great many years. The company also announces the appointment of F. E. Bauer, Jr., as export sales manager with offices at 50 Church St., New York City. Mr. Bauer has represented the American Hoist and Derrick Co. in foreign fields for many years, and has a wide knowledge of business conditions in Asia and the Orient.

Timken Roller Bearing Co., Canton, Ohio, has appointed Judd W. Spray as vice-president and general sales manager. Mr. Spray has been general sales manager of the company since 1926, and previous to that he had been sales manager of the Automotive Division of the company in Detroit for several years. The company's subsidiary, the Timken Steel and Tube Co., Canton, Ohio, started on a full capacity production schedule on January 17. The plant has a capacity of 30,000 tons of alloy steel per month, and the capacity is about equally divided between electric furnace and open hearth steels. It is said to be the first plant of its kind to be completely anti-frictionized, and no expense has been spared to make it one of the most efficient of its kind for the production of high grade alloy steel.

Trade Literature

Oil Engines Bulletin **No. 32K** describing Anderson type "K" engine, 30 to 325 hp., completely illustrated with table of specifications, etc. ANDERSON ENGINE AND FOUNDRY CO., Anderson, Ind.

Power Factor Correction with Capacitors. Completely illustrated 48-page book entitled "Reducing the Cost of Electric Power," explaining the construction of capacitors, giving a non-technical explanation of power factor, and showing when and how to apply capacitors to reduce electric power cost. ELECTRIC MACHINERY MANUFACTURING CO., Minneapolis, Minn.

Power Shovels and Excavating Machines. A most attractive and interesting looseleaf handbook on the operation, care, adjustment and application of power shovels and excavating machines. The book is divided into three sections. The first gives detailed instructions for shovel, clamshell, dragline and back-digger work, including cable reeving and ways of loading and unloading machines for transportation. The second section, covering the care and adjustment of machines, is very specific, and gives complete details on how to maintain machines in best operating condition. The handbook section of the book, or the third section, contains exceedingly helpful data, including material weight tables, equivalent and conversion tables, layouts for various job conditions, suggestions for a cost system, data on electric systems, drilling and blasting, etc. THEW SHOVEL CO., Lorain, Ohio.

Automatic Packing Machinery. Catalog **No. 103** describing fully the company's various types of "Eureka" packing machines for fine ground materials such as cement and lime (includes also flour and grain sackers). Contains 56 pages and is fully illustrated with pictures and diagrams of the units. S. HOWES CO., INC., Silver Creek, N. Y.

Vertical Air Filters. A bulletin describing and illustrating the company's "Sinuous" type of vertical air filter and showing by means of diagrams the action of the air within the unit. **Horizontal Air Filters.** Bulletin describing the company's "Sinuous" type of horizontal air filters, illustrated with diagrams to show principle involved in the unit. MIDWEST AIR FILTERS, Bradford, Penn.

G. E. Bulletins. GEA-823B. Bulletin describing and illustrating the company's automatic hydrogen arc-welding equipment for hand welding on 50- and 60-cycle circuits. **GEA-941A.** Bulletin describing the new "Type CP," motor-driven, center-gear, reciprocating air compressors for railway and industrial use. **Some Outstanding Achievements of 1928.** A 12-page booklet addressed to the stockholders of the company detailing the particular achievements of the General Electric Co. during 1928.